The Lawrence T. Post Issue

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THIRD SERIES FOUNDED BY EDWARD JACKSON

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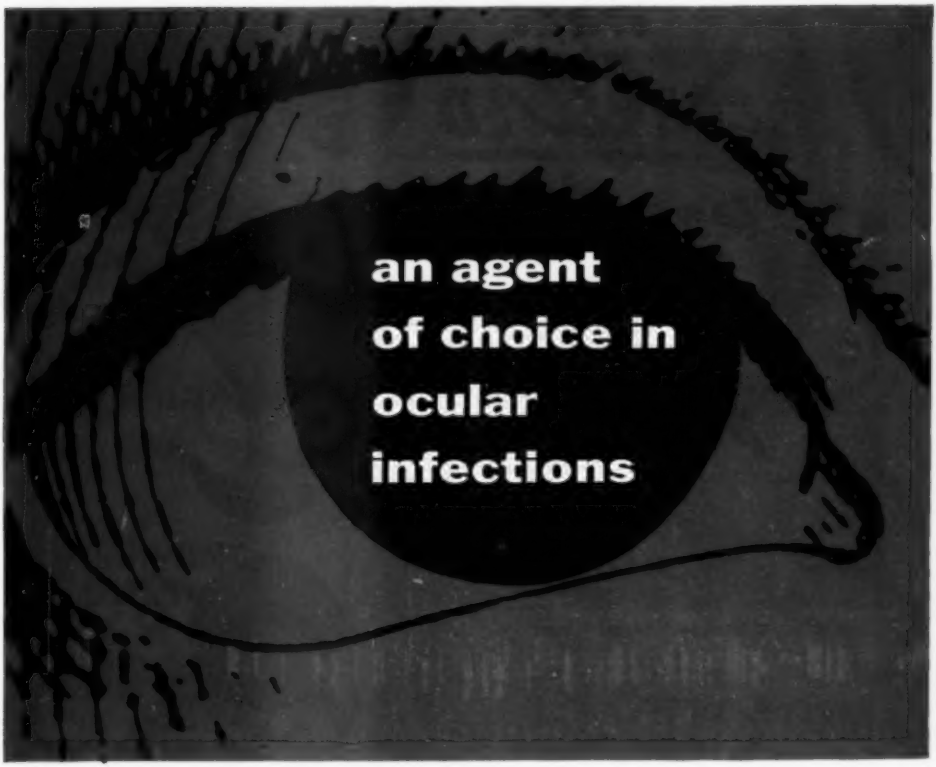

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Manufacturing Chemists
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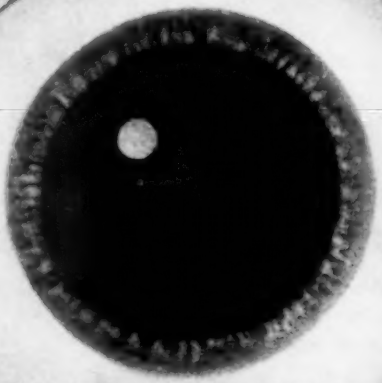
New Product...

for CYCLOPLEGIA and MYDRIASIS

CYCLOGYL

HYDROCHLORIDE

Brand of Cyclopentolate hydrochloride



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2. Satisfactory duration of action.
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5. Little if any increase in intra-ocular tension due to [illegible]
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7. Effective in highly pigmented eyes normally refractory to cycloplegics and mydriatics.

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Children: One or two drops of either 0.5% or 1.0% CYCLOGYL, followed ten minutes later by second instillation. pretreatment the evening before refraction is not normally necessary with CYCLOGYL.

Supplied: 0.5% Sterile Ophthalmic Solution — 15cc Dropper Bottles
1.0% Sterile Ophthalmic Solution — 15cc Dropper Bottles

1. Gesser, B. C., and Leopold, I. H.: Arch of Ophth. 49:36 (Jan.) 1953
2. Sudnow, I. H.: Am. J. Ophth. (Jan.) 1953
3. Petersburg, B. S., and Medine, M. N.: Am. J. Ophth. 34:532 (April) 1951

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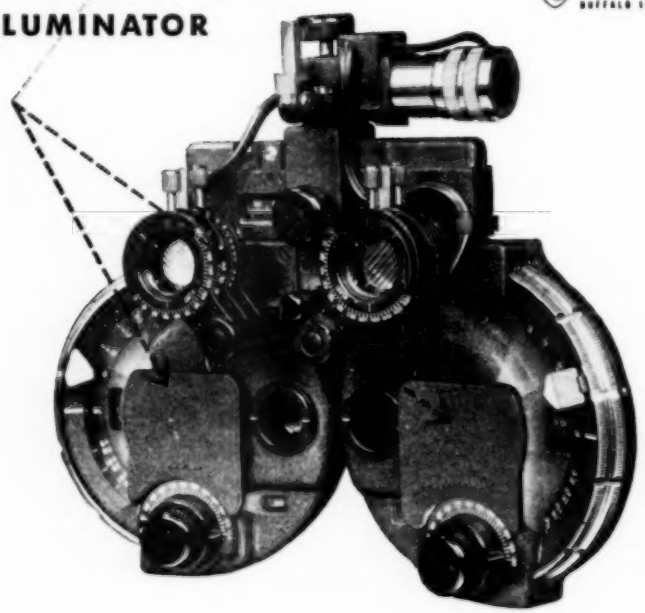
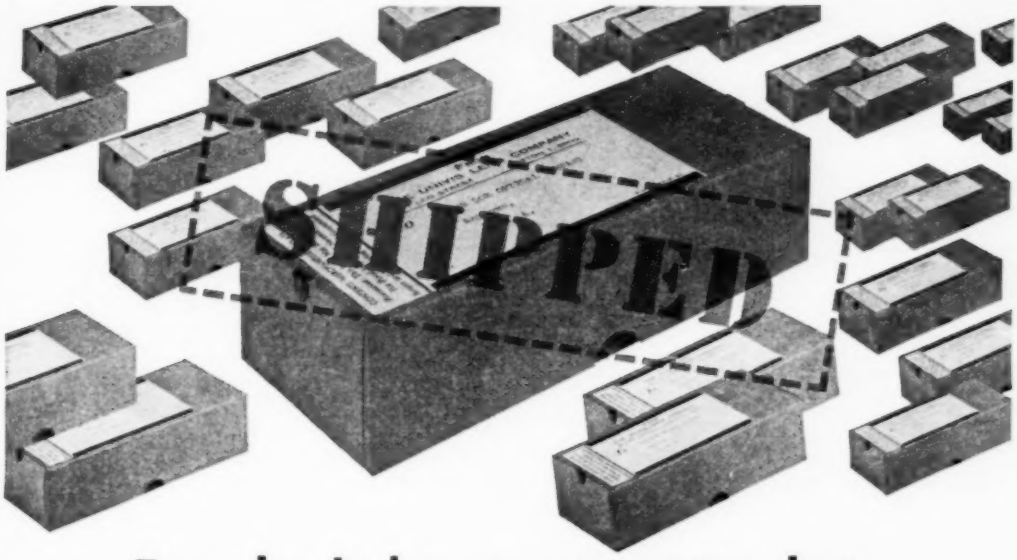
If you are planning to purchase a new phoroptor—choose an AO 590 equipped with this new illuminator. Or your AO Representative can install one on your present 590 Phoroptor.

American Optical

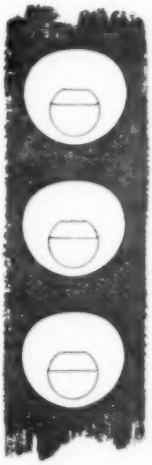
INSTRUMENT DIVISION
BUFFALO 15, NEW YORK

A NEW ATTACHABLE ILLUMINATOR





Everybody has a guarantee, but nobody tells you what happens!



This ad is about two significant optical "firsts."

1. Univis guarantees the *principle* behind Continuous Vision Lenses—not just the product itself—and has done so since January, 1951.

(As you undoubtedly know, Univis will replace any unsatisfactory CVs with Univis D bifocals, ground to Rx, free—whatever the cause of the dissatisfaction.)

2. Univis now gives you the *results* of this unprecedented guarantee.

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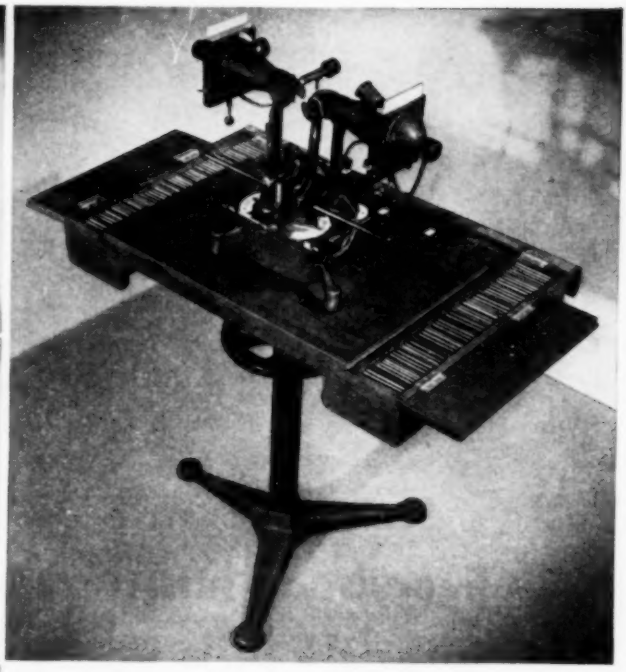

THE MOORFIELDS SYNOPTOPHORE

from

CLEMENT CLARKE

of

England

The Moorfields Synoptophore has long enjoyed the universal recognition as the most important orthoptic apparatus. Originally evolved from the simple Worth's Amblyoscope, its development has kept pace with the many improvements in orthoptic technique.

When the two optical tubes are moved through any angle the movements are concentric with those of the visual axes. A simple slow motion device is provided for duction exercises, and by releasing a locking key the two tubes may be rotated in co-ordination for kinetic exercises.

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The interlenticular distance may be varied from 50 mm. to 80 mm. Interpupillary distances smaller than 50 mm. are perfectly accomodated. Cyclophoria and hyperphoria may be measured with great accuracy and the slow motion vertical screw is also valuable in estimating vertical ductions. Other features include adjustable chin and forehead rests, two flashing switches of the latest micro type and two dimming rheostats.

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The Lyle Major Amblyoscope, Hess Screens, Cheiroscopes, Worth's 4 Dot Test, Diplopia Goggles, Rotating E Test, Maddox Handframe, Maddox Wing Test, Bar Readers, etc.

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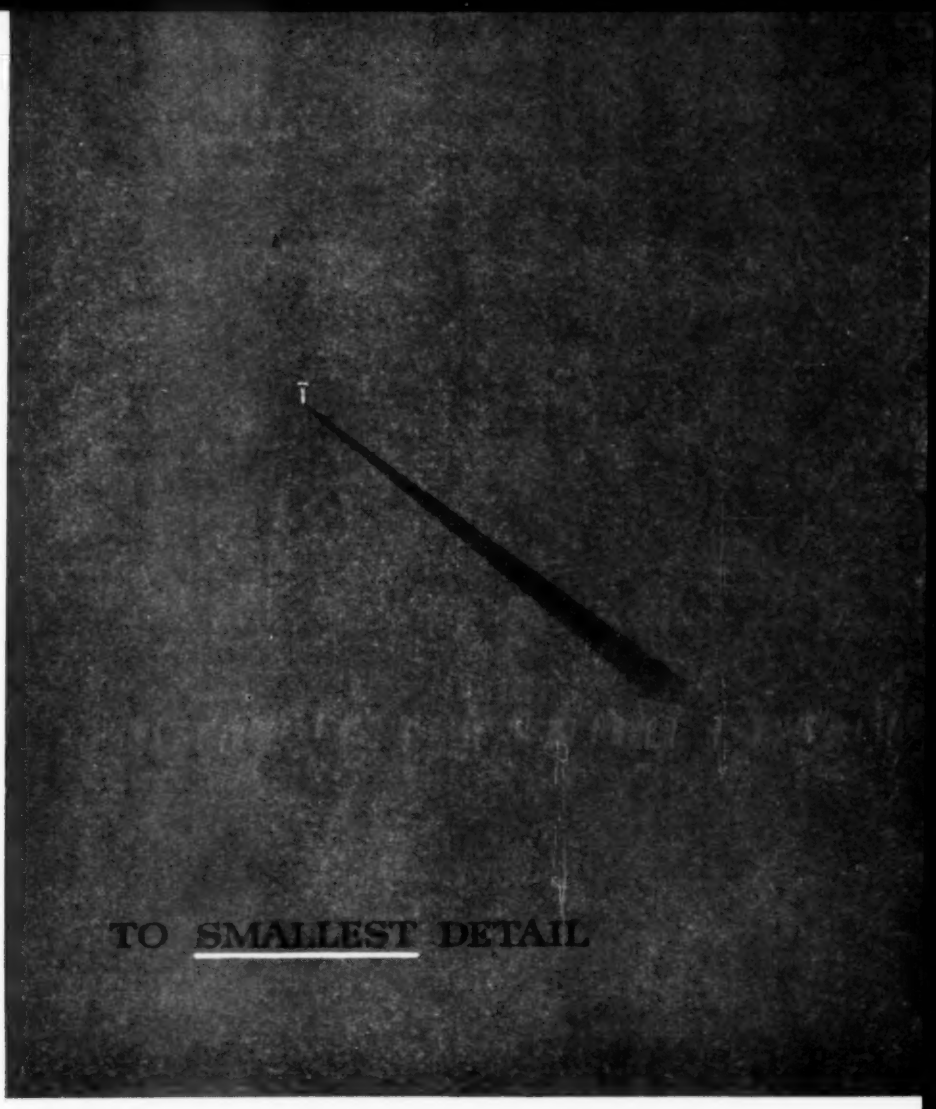

Care and accuracy, the Shuron watchwords, tied to the personal pride each worker takes in turning out a perfect product (whether frames, lenses, cases or machinery) — treating each unit as if it were custom made is the reason why Shuron products have consistently been the leaders in quality. Coupled with the smartest in fashion styling, Shuron products spell complete patient confidence while building professional reputation for you.

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The House of Vision
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The Magnet that has THE BIGGEST "PULL."
The Magnet that allows you to SEE WHAT IS HAPPENING.

The Philps Giant Magnet

MADE BY
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Some other points

- Applicators readily removed for sterilizing.
- Four different shaped applicators provided.
- Magnet counter-balanced for feather touch.
- Locks on all movements.
- High and low powers from same footswitch.

THEODORE HAMBLIN LTD
DISPENSING OPTICIANS
15 WIGMORE STREET
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ZINCFRIN

DESCRIPTION: A non-stinging, non-irritating ophthalmic solution containing .25% Zinc Sulphate, Benzalkonium Chloride 1:5000 and .12% Phenylephrine Hydrochloride U.S.P. Tonicity and pH values adjusted to closely approximate those of tear secretions.

INDICATIONS: Infectious, allergic, catarrhal or inflammatory conjunctivitis in which the astringency of Zinc Sulphate combined with vaso constrictor properties of Phenylephrine HCI. USP may be desirable.

SUGGESTED DOSAGE: Adult and Child—Two or three drops in affected eye every three hours or as directed by physician.

AVAILABILITY: Zincfrin—Available in prescription pharmacies in 15cc blue dropper bottles. Literature and samples on request.

Manufactured by

ALCON LABORATORIES, INC., FORT WORTH, TEXAS

OP-THAL-ZIN

DESCRIPTION:
A non-stinging, non-irritating ophthalmic solution of Zinc Sulfate ¼% with pH and tonicity values closely approximating those of tear secretions with Benzalkonium Chloride 1:5000 as a "wetting agent" and preservative.

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SUGGESTED DOSAGE:
Adult and Child—Two or three drops in affected eye every three hours, or as directed by Physician.

SUPPLIED: Op-thal-zin 15cc Blue Dropper Bottles.

AVAILABILITY: Available in prescription pharmacies in 15cc blue dropper bottles. Literature and samples on request.

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OPHTHALMIC VEHICLE:
Containing 1% Methyl Cellulose Ophthalmic in aqueous saline solution with Benzalkonium Chloride 1:50,000 as a preservative and "wetting agent."

INDICATIONS:
1. Ophthalmic emollient and lubricating agent in retarded lacrimation states, and as protective lubricant for pathologic conditions.
2. Vehicle for various soluble Ophthalmic Drugs: Antiseptics, Antibiotics, Sulfonamides and various alkaloidal salts.
3. As a physiologic non-greasy suspending agent for insoluble Ophthalmic medications: Cortisone, insoluble Sulfonamides, etc.

ADVANTAGES: Viscosity—plus soothing-lubricating effect—provides better and more prolonged contact of medication with affected area.

AVAILABLE: Isopto Alkaline available in prescription pharmacies in 15cc blue dropper bottles. Samples, literature and suggested prescription formulas available on request.

Manufactured by
ALCON LABORATORIES, INC., FORT WORTH, TEXAS

ISOPTO CETAMIDE

NEW PRODUCT
For increased efficacy of Ocular Sulfonamide therapy—with comfort.
Isopto Cetamide—contains Sodium Sulfacetamide, 15% w/v in soothing .5% Methyl Cellulose Ophthalmic Solution.
INDICATIONS:
Acute chronic conjunctivitis, acute traumatic corneal ulcer, blepharitis and other external eye infections caused by microorganisms susceptible to sulfonamide therapy.

- Comfortable to the eye.
- More intimate and prolonged eye surface contact.
- Better patient cooperation.
- Stable.

CAUTION:
This preparation should be used with care in the treatment of patients who have previously exhibited sensitivity to sulfonamides. Should undesirable reactions occur, discontinue use immediately.
Federal Law prohibits dispensing without a prescription.
Isopto Cetamide is available in 15cc blue dropper bottles in prescription pharmacies. Literature and samples available on request.

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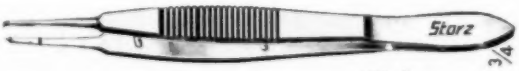

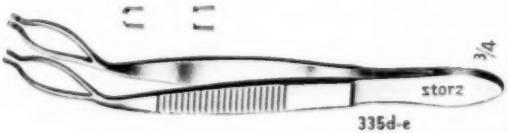

Storz Instrument Company

4570 Audubon Ave. St. Louis 10, Missouri

THE NEW Rodenstock EYE-REFRACTOMETER

Excellent for the objective determination of refractions of the human eye, the Rodenstock eye-refractometer permits instantaneous readings of spherical and cylindrical refractions including inclination of the axis.

It enables you to diagnose objectively problem cases like children, illiterates and cases of pin hole pupils, as size of pupil has no effect on efficiency.

Range from plus 20. O D to minus 20. O D

NEW EDITION... PROF. AMSLER'S QUALITATIVE VISION TEST CHARTS

These charts designed by Professor Marc Amsler of Zurich (which were demonstrated by him at the Oxford Ophthalmological Congress last year) make it possible to detect, localize and analyze the visual functional disturbances which accompany the beginning and evolution of the maculopathies. Many functional disturbances affecting the central and paracentral region of the field escape the usual quantitative test of central vision, which does not really bring into account the quality of the visual trouble. By means of these charts such qualitative measurements are easily made. Seven charts in sturdily bound book and set of record charts. Only $12.00

KRAHN *Rapid-Change* TABLE

By combining two instruments on one table, there is no need for the physician or patient to change position during the examination. Simultaneous height adjustment for two instruments.

The instruments are easily movable on rails into working position . . . are locked automatically. Sturdy construction. Table top is heatproof and acidproof.

Instrument on left side of table is the **Krahn Slit Lamp Binocular Microscope (Model HSE).** One hand control lever (joy-stick) for all direction positioning • Combined adjustability for Slit Lamp and Microscope with constant focus • Same center level for slit and microscope of every axial rotation • Hruby lens • Brilliant illumination • Sharply defined vertical and horizontal slit • Interchangeable to Binocular Ophthalmoscope • Instrument on right is the **Krahn Ophthalmometer (Model BE).** One-hand control lever (joy-stick) for all direction positioning • Rapid and accurate measurements by new optical technique • Optical readings of refractive values and radii • Bright fixation point • Tabo and International Schema • Test images according to Javal • Specially adapted for Contact Lenses. Range of Measurement: Refractive power 30-60 diopters. Radii 5.5-11 mm

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- ☐ Krahn Rapid-Change Table
- ☐ Krahn Slit Lamp (Model HSE)
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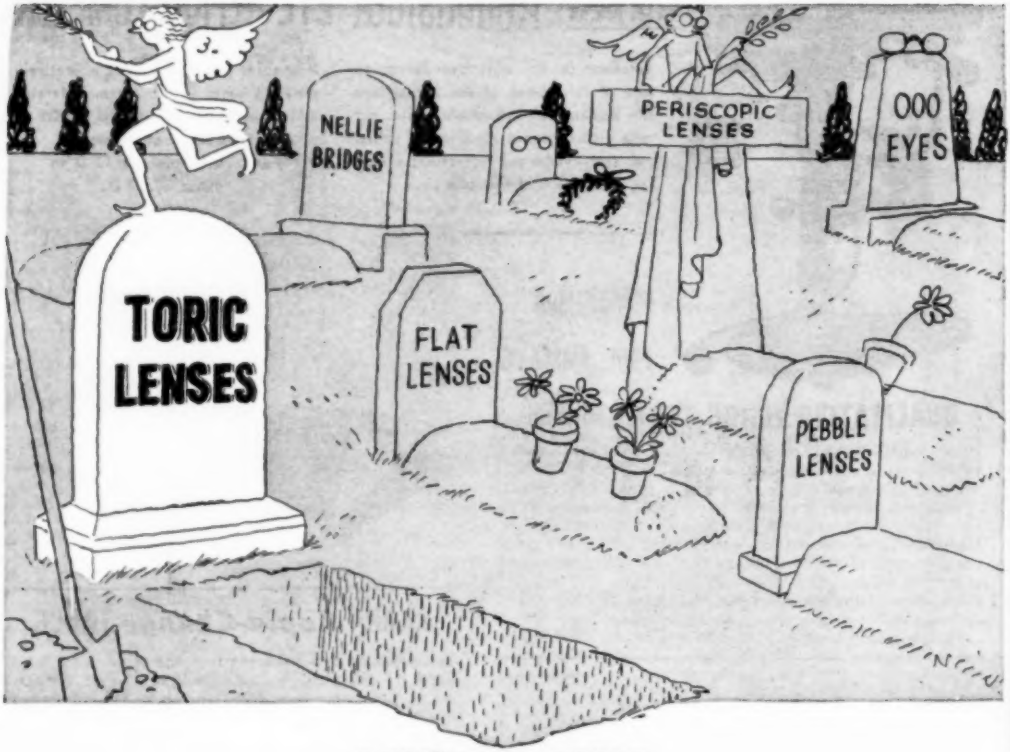

ISN'T IT TIME
WE BURIED THIS ONE, TOO?

Optical people the country over are beginning to realize that the six-base lens is a dead duck – that advances in lens manufacture during the past few years have provided a better, more scientific product for the professional man's prescriptions. Many refractionists have recognized the value of corrected lenses and prescribe them regularly. This, in turn, has upgraded professional services in many areas, but the *big* job – that of converting *completely* to the modern corrected lens – is yet to be done. Today's standard in corrected lenses is Orthogon, designed to correct for marginal astigmatism below the limits of physiological perception. Orthogon curves are *standard* in Soft-Lite. In single-vision, Panoptik, ST, Orthogon C. D. F and many other multifocal types, Orthogon curves are *another* point of superiority of Soft-Lite over imitations. Isn't it time we buried the old-fashioned toric lens in favor of the *modern* standard?

P.S. *There's one standard that hasn't changed over the past 44 years – Soft-Lite's neutral absorption!*

Soft-Lite Lenses

a standard, when prescribed in ORTHOGON!

Doctor:

When you specify Iso-Sol your patients receive ophthalmic solutions that are:

- sterile
- buffered for maximum stability
- preserved against contamination
- quality-controlled
- isoosmotic where possible
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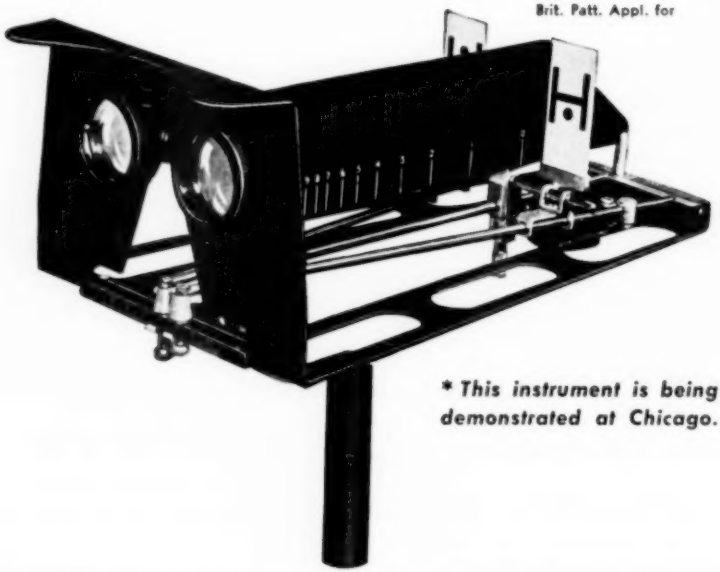

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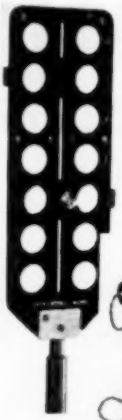

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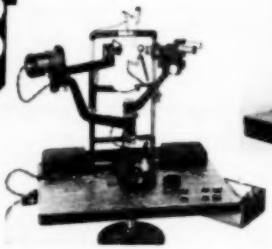

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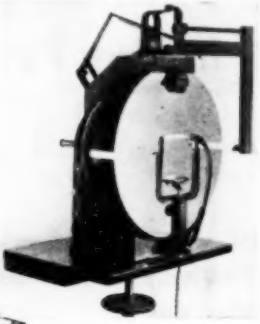

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SERIES 3 · VOLUME 36 · NUMBER 9 · SEPTEMBER, 1953

THE LAWRENCE T. POST ISSUE

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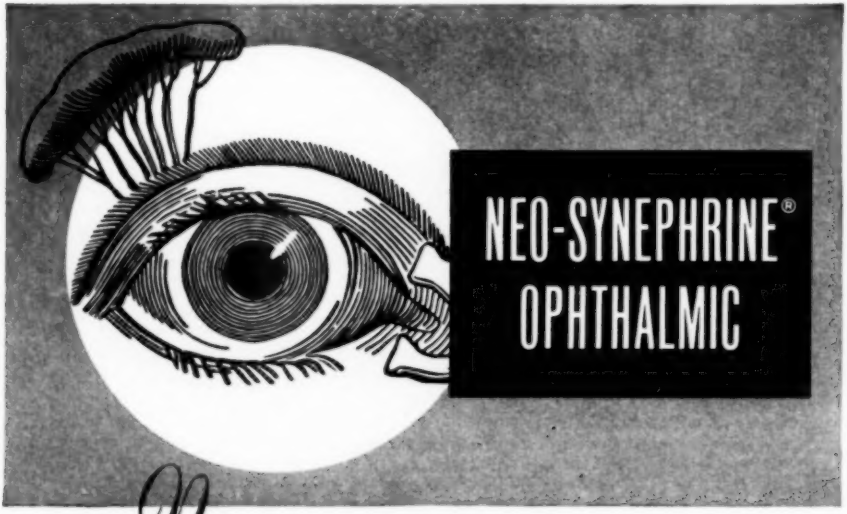

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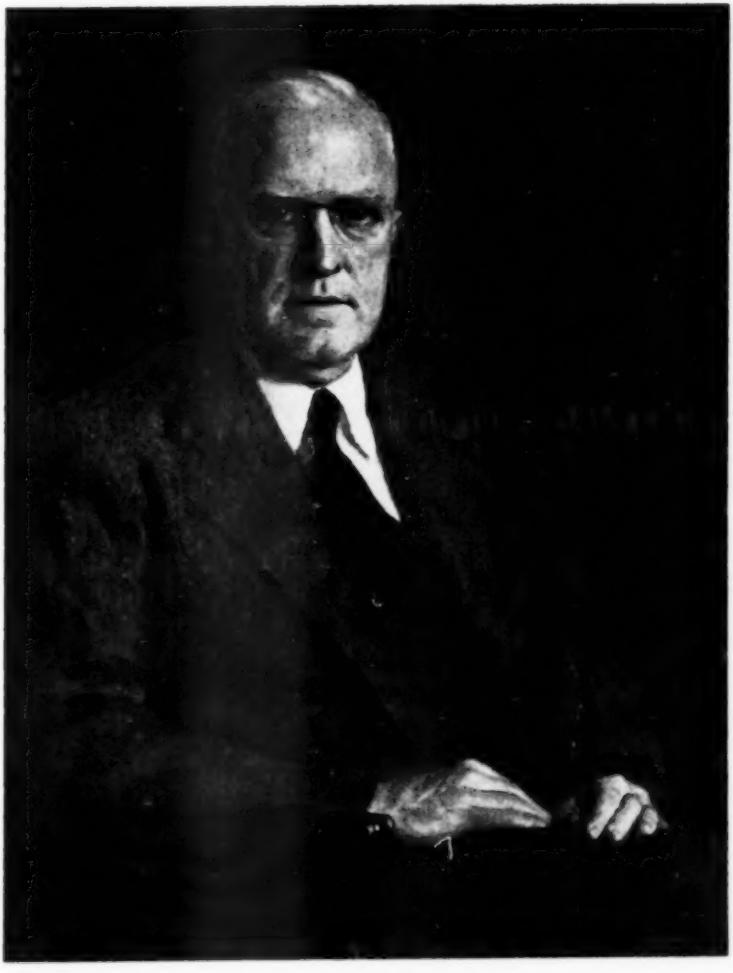

LAWRENCE T. POST, M.D.

REMARKS MADE ON ACCEPTANCE OF THE PORTRAIT OF LAWRENCE T. POST, M.D.

ROBERT A. MOORE, M.D.
(DEAN OF THE WASHINGTON UNIVERSITY MEDICAL SCHOOL)
Saint Louis, Missouri

On behalf of Washington University and the School of Medicine, I accept this fine portrait as evidence of your regard of our own Lawrence Post. I can only assure you that we at the university have an equal regard for him.

When we think of an institution such as a medical school or hospital, we are likely to think of the institution. But, an institution is only as great as the men and women who constitute it. A school of medicine is only as great as are the men on the faculty. The reputation of a hospital in the eyes of the public is simply the sum total of the reputation of the individual staff members.

I need not tell this group that the contribution of Dr. Lawrence T. Post to the reputation of the Washington University School of Medicine, the Barnes Hospital, the St. Louis Children's Hospital, the McMillan Hospital, and the Oscar Johnson Institute has been a large one.

Shortly after he returned to St. Louis from his specialty training he joined the group of General Hospital No. 21—the Washington University Unit which served in France. After the war, his scientific and academic progress was rapid and he rose from assistant to full professor in 12 years between 1919 and 1931. During this same period we have heard from others that he had time to devote to his specialty, his colleagues, and his friends. In 1933—two years later—he was designated head of the Department of Ophthalmology and has served in that capacity for 20 years, the only part-time head of a department in the school. But I hasten to add, and to his great credit, that no one at the school thinks of him as any different from any other head.

If all faculty members were like Lawrence, the life of a dean would be simple. Do not mistake me, he fights for what he thinks is right. But you know in advance that the discussion will be fair. Lawrence will listen to both sides of a question and his attitude will be generous even if he does not agree.

Lawrence, we at the University, the School of Medicine, and the Medical Center accept your retirement from only one position—the headship of the department. You are not retiring from your position as a valued member of our group, as a teacher, an investigator, a clinician, and most of all, a senior advisor to those of us in the next generation.

In my book, and in that of your colleagues, you have been promoted, not retired; promoted from professor to senior professor, promoted from an administrator to a scientist and teacher, promoted from a routine life to one in which you and Bernice can do some of the things you have always wanted to do.

March 28, 1953.

CURRICULUM VITAE—LAWRENCE T. POST

Born: December 25, 1887; son of Martin Hayward and Mary Lawrence Tyler Post, St. Louis, Missouri

Married: Bernice Lightner—March 15, 1924

Children: Lawrence Tyler, Jr.; Stephen Lightner; Robert Henshaw

Education

Yale, A.B., 1909

Johns Hopkins Hospital, M.D., 1913

Surgical internship, South Baltimore Eye, Ear, Nose, and Throat Hospital, 1914-1915

Associate Surgeon in Pathology; Massachusetts Charitable Hospital, August, September, and October, 1914

Associated with James Bordley, Jr., South Baltimore Eye Hospital, 1914-1915

Licensed: Missouri, November 15, 1915

Private Practice: St. Louis, Missouri, 1915-

Societies—Affiliations

THE AMERICAN JOURNAL OF OPHTHALMOLOGY
- Editor, 1924-1941
- Editor-in-Chief, 1931-1940
- Acting Editor-in-Chief, 1942-1945

Ophthalmic Publishing Company
- President, 1941

American Ophthalmological Society
- Vice-President, 1950
- President, 1951

American Academy of Ophthalmology and Otolaryngology
- President, 1944
- Vice-President, 1928

Southern Medical Association
- Past Chairman Ophthalmic Section

American Medical Association
- Past Chairman, Ophthalmic Section

Missouri State Medical Association

St. Louis Ophthalmological Society
- Past President

St. Louis Medical Society

Barnes Hospital Society

Sigma Xi

Zeta Psi

Phi Beta Pi

Ophthalmological and Otolaryngological Military Surgical Manuals
- Co-Author

Member, Ophthalmological Committee of National Defense
- Surgical Advisory Committee, 1941

Member, National Research Council for the Armed Forces
- Consultant on Administration Board

Consultant, Veterans Administration, 1946-July 1, 1951

Military Service

U. S. Army, Medical Reserve Corps, 1917, Major 1919

Surgical Director, American Mobile Hospital No. 4, A.E.F., 1917

Lt. Colonel, Medical Reserve Corps, 1917-1932

Clubs

University; St. Louis Country; Round Table (St. Louis); Pithotomy (Baltimore)

Hospital Affiliations

Professor of Clinical Ophthalmology and Head of the Department, Washington University, 1933-1953

Ophthalmologist-in-Chief, Barnes and Allied Hospitals (includes McMillan Hospital), 1933-

Visiting Staff:
- St. Louis City Hospital
- St. Louis County Hospital
- Homer G. Phillips Hospital
- St. Luke's Hospital
- St. Mary's Hospital

Honors

The Howe Gold Medal of the American Ophthalmological Society, 1947

The Dana Medal for prevention of blindness, 1949

SUBHYALOID HEMORRHAGE FOLLOWING SUBARACHNOID HEMORRHAGE*

Report of two cases

Frederick C. Cordes, M.D.
San Francisco, California

The observation within a short period of time of two cases of subhyaloid hemorrhage associated with subarachnoid hemorrhage inspired a review of the reports of this association in the literature and a survey of the cases of subarachnoid hemorrhage seen at the University of California Hospital in which intraocular changes were observed. The histories of the cases of leukemia seen at the Oncology Laboratory that developed subarachnoid hemorrhage have also been reviewed.

From the standpoint of etiology, subarachnoid hemorrhage can be divided into two main types, the traumatic and the spontaneous.

The *traumatic* cases, which are due to the rupture of meningeal vessels, are the more common and are usually the result of basal fracture. The intracranial hemorrhages that follow cranial operation should also be included in this group.

Of the *nontraumatic* cases, rupture of a basal aneurysm accounts for about 46 percent. Other causes include meningeal hemorrhage in blood diseases, diabetes, renal disease, hypertension, thrombosis of the cerebral vessels, and bleeding from metastatic tumors.

Most of the causal aneurysms are congenital and unassociated with hypertension or vascular disease. Not infrequently the actual rupture of the aneurysm is preceded by premonitory signs and symptoms over a long period of time. According to Duke-Elder,[1] these include severe paroxysmal headaches that are sudden in onset, develop after exertion, and are often associated with tinnitus. They may be subject to periodic exacerbation until eventually a catastrophe occurs, indistinguishable in its effect from any major intracranial hemorrhage. The actual accident of rupture is usually precipitated by a temporary rise in blood pressure.

Ocular palsies, exophthalmos, nystagmus, field changes, pupillary changes, and papilledema have all been reported in connection with subarachnoid hemorrhage, but it is the so-called typical subhyaloid hemorrhage following subarachnoid hemorrhage with which we are presently concerned.

It is surprising how little is to be found in the ophthalmology textbooks on the subject. Walsh[2] states that the intraocular hemorrhages associated with subarachnoid hemorrhage may be small and near the disc but that when they are subhyaloid they tend to be relatively extensive and then, although usually near the disc, may also be at some distance from it; in the typical case they form a subhyaloid wreath around the disc. According to Duke-Elder,[1] they may be accompanied by other fundus lesions of the arterial or blood disease which has caused the cerebral hemorrhage. Most cases, however, occur in a young age group in which there are few if any vascular changes in the retinal vessels, and if retinal hemorrhages develop they tend to be small and near the disc.

If they are preretinal, on the other hand, they may be very large; Drews and Minckler[3] reported a case in which the entire posterior pole of each eye, for a width of some 10 disc diameters, was covered by preretinal hemorrhage. If such a hemorrhage ruptures into the vitreous, the entire disc may be obscured (Rea[4]). In the cases reported by Riddoch and Goulden,[5] Paton,[6] and others, the

* From the Department of Ophthalmology of the University of California Medical Center at San Francisco, California.

hemorrhage was so extensive that, when it ruptured into the vitreous, it obscured all details of the fundus for a considerable period of time. Occasionally these hemorrhages may be subretinal, as in Symonds' patient,[7] and still more rarely punctate retinal hemorrhages have occurred.[5]

Subhyaloid hemorrhage in association with subarachnoid hemorrhage is an infrequent finding. Symonds[7] reported 124 cases of cerebral hemorrhage and in only 24 of them was there any mention of fundus findings. In a group of cases of subarachnoid hemorrhage from all causes, Rea[4] reported a 50 percent mortality. If the patient survives, any subhyaloid hemorrhages that have occurred disappear but may leave a pigmented band around the disc. According to Favory,[8] early observers attached great importance to a pigmented ring, black or brown, about the disc as a sign of previous hemorrhage into the optic nerve sheaths, and Walsh[2] expressed the opinion that such a ring is probably occasionally associated with subarachnoid hemorrhage in the absence of evulsion of the optic nerve.

Subhyaloid hemorrhage is sufficiently characteristic for MacDonald[9] to state that the recent occurrence of one in an unconscious patient may be an indication of a severe intracranial hemorrhage. Diagnosis is confirmed by a long history of intermittent headaches, and by the finding of bloodstained cerebrospinal fluid under pressure.

A number of theories have been advanced to account for the formation of these subhyaloid hemorrhages in patients with subarachnoid hemorrhage. In order to understand them the anatomy of the subarachnoid space must be kept in mind.

As described by Walsh,[2] the subarachnoid space, situated between the arachnoid and the pia mater, covers the surface of the brain and spinal cord and extends along the optic nerve in the region where the subdural and subarachnoid spaces together are known as the intervaginal space. Between these two separate spaces there is no intercommunication. The subarachnoid space over the cerebrum communicates with the space about the optic nerves. Ballantyne[10] showed that hemorrhage can extend from the cerebrum to the orbit in this space; Walsh[2] concurred but considered such an extension unusual. A subdural hemorrhage in the optic nerve sheaths remains entirely independent of any hemorrhage in the cerebral chamber.

The arachnoid membrane is separated from the dura by a potential cavity, the subdural space, and is intimately connected by numerous pia-arachnoid trabeculae with the pia mater which closely invests the brain, extending into all the sulci. At the base of the brain the subarachnoid space is expanded into basal cisternae, the largest being the cisterna magna; anteriorly this cisterna communicates with the cisterna pontis and this in turn with the cisterna interpeduncularis.

The spinal fluid passes through the foramen of Monro into the third ventricle and thence through the aqueduct of Sylvius into the fourth ventricle; entrance into the subarachnoid space from the fourth ventricle is via the foramen of Magendie and the foramina of Luschka.

The source of associated intraocular hemorrhages has been the subject of controversy. Liebrecht[11] regarded them as a result of direct leakage of blood through the lamina cribrosa and along the perivascular spaces into the optic nervehead and the preretinal and retroretinal tissues. Symonds[7] felt that there was sufficient pressure in the optic nerve sheaths to force the passage of blood through the lamina cribrosa.

According to Grecar,[12] Uhthoff was the first to question the possibility of direct hemorrhage from the intervaginal space into the retina, and Grecar himself regarded the intraocular hemorrhage as the result of sudden and severe interference with the return venous flow of blood from the retina.

MacDonald[9] made serial sections of four specimens, which included two in which there were large subhyaloid hemorrhages,

and came to the conclusion that the blood of the subhyaloid pool did not communicate by a rupture of any kind with the hemorrhage in the meningeal spaces about the optic nerve. He also concluded that the subhyaloid hemorrhage resulted from rupture caused by the back pressure in the veins of the retina.

Riddoch and Goulden[5] commented on the fact that the ophthalmoscopic appearance of the venous engorgement of the retina conformed rather closely to the appearance of a thrombosis of the central retinal vein. They also noted that although the obstruction causing hemorrhage of the optic nerve sheath is sudden, it is neither as complete nor as prolonged as it is in thrombosis and the results are therefore less serious.

Riddoch and Goulden[5] suggested that the underlying cause of this congestion of the venous return from the retina is compression of the central retinal vein by hemorrhage in the intervaginal space. Drews and Minckler[3] agreed on the role played by increased pressure within the intervaginal space but suggested that double angulation and axial elongation of the central retinal vein in its intervaginal course might also play a part.

MacDonald[9] stated that the increased intracranial pressure produces congestion of the central veins of the nerve by obstructing the flow of venous blood as the vein passes through the meningeal spaces.

Miller and Cuttino[13] suggested that preretinal hemorrhages accompanying subarachnoid hemorrhage are the result of sudden increase in preretinal intravenous pressure arising from compression of the choroidal anastomosis of the central vein of the retina at the level of the lamina cribrosa, and from compression of the central vein at its intervaginal portion, by extension of the subarachnoid hemorrhage into the intervaginal space about the optic nerve.

These theories do not explain the cases in which the hemorrhages occur without any evidence of hemorrhage in the intervaginal space at autopsy. Drews and Minckler[3] found that on the 24th day after the onset of the brain hemorrhage in their case there were only "the remains of hematoma . . . in the subarachnoidal space of the optic nerves." They concluded that hematoma had been present but had been absorbed.

The most recent work on this subject is that of Walsh and Hedges[14] who made serial sections of the autopsy material from six cases of spontaneous intracranial subarachnoid hemorrhage. They studied the entire optic nerve, bony canal, and posterior segment of each eye. In addition they analyzed 180 cases of hemorrhage into the optic nerve sheaths.

On the basis of these studies they concluded that optic nerve sheath hemorrhages do not originate in a forward passage of blood from the intracranial meningeal spaces; that if blood does pass through the optic canal it is in extremely small amounts; that optic nerve sheath hemorrhages originate in the rupture of venous channels in the dura; and that subdural hemorrhages are therefore relatively more frequent than subarachnoid hemorrhages. They regarded both hemorrhages as having the same origin, however.

Local rupture of veins accounts for the hemorrhages that occur in the cranial nerves, the cavernous sinus, the optic chiasm, the intracanalicular portion of the optic nerve, the orbital dura at the entrance or exist of vessels, and all the orbital tissues. They felt that the presence of these hemorrhages was a manifestation of increased venous pressure which was transmitted from the cranium to the orbit; that hemorrhages occur as a result of the rupture of veins in which the supporting structure of the vessels is altered, for example, in passing from the optic canal into the orbit and at their entrance or exit from the dura.

Walsh and Hedges[14] found that the frequency of retinal and subhyaloid hemorrhage varied directly with the severity of the cerebrovascular accident and the presence or absence of edema. In those cases of intracranial hemorrhage in which there was very

little cerebral edema, retinal and subhyaloid hemorrhages were very rare.

Seventy-five percent of the subhyaloid hemorrhages were found in cases in which there had been spontaneous intracranial subarachnoid hemorrhage. In two cases the subhyaloid hemorrhages were found to be due to rupture of the central retinal vein anterior to the lamina cribrosa. This the observers felt established beyond question the presence of increased venous pressure which was transmitted from the cranial cavity to the orbital veins. The presence of scattered intraorbital hemorrhages furnished further proof of such pressure. They also made the observation that optic nerve sheath hemorrhages are seen in the absence of intracranial bleeding.

On the basis of these several observations they concluded that the subhyaloid hemorrhage is the result of increased venous pressure transmitted from the cranial cavity to the orbital veins, including the central retinal vein.

Case reports

Case 1

A. S., a man aged 63 years, was subjected to an eye examination on November 6, 1951, in the course of a search for the cause of a severe headache of sudden onset and of only a few days' duration. The patient had no visual complaints.

Eye examination. Vision was: R.E., 20/20; L.E., 20/20.

External examination negative.

Fundi. R.E.: Media clear. There was a wreath of flame-shaped hemorrhages, subhyaloid in character, partly covering the disc and extending approximately two disc diameters from the disc and partly covering the vessels. The remainder of the fundus displayed the changes of hypertension grade II-III. No other hemorrhages were seen.

L.E.: Media clear. There was a wreath of hemorrhages, similar to those in the right eye, partly covering the disc and extending subhyaloid into the surrounding area.

Ophthalmoscopic diagnosis. Subhyaloid hemorrhage, possibly following subarachnoid hemorrhage.

The patient was referred to his physician who found his blood pressure to be 210/120 mm. Hg. A spinal fluid tap revealed a bloody fluid. Aside from this the general examination was essentially negative.

Diagnosis. Subarachnoid hemorrhage due to hypertension.

Case 2

Valentine G. (#195250), a 44-year-old white married woman, was admitted to the University of California Hospital, October 8, 1951. Her chief complaint on entry was headaches and vomiting for the past two months. For the past week she had slept most of the time.

The general physical examination was essentially negative except for the absence of the right breast which had been removed in 1947 because of a reported malignancy. Blood pressure was 160/110 mm. Hg. There was a right sixth-nerve palsy and a suggestion of left lower facial underactivity. In addition, there was a slight weakness of the left arm. The presence of a tumor in the right cerebral hemisphere was suspected.

Eye examination (October 8th). Vision was: R.E., 20/40; L.E., 20/60.

The visual fields were normal centrally but showed peripheral constriction. In view of the patient's lack of attention and co-operation, these field study results were not considered completely reliable.

The fundi showed bilateral papilledema with congestion of the veins. No hemorrhages were seen.

X rays revealed a bone lesion over the right parietal area which on biopsy was found to be carcinomatous. Carotid arteriograms were essentially negative.

On October 27, 1951, ventriculograms were taken through burr holes with essentially negative results. The taking of the ventriculograms was followed by an edema

of the right and left orbits which persisted for over a week.

Fundus examination November 1st (four days after the taking of the ventriculograms). R.E.: Media clear. There was a papilledema of two diopters. Flame-shaped hemorrhages partly covered the disc and formed a wreath that extended some two or three disc diameters from the disc. These obscured the disc and retinal vessels in this area. There was a small hemorrhagic protrusion into the vitreous. The veins were congested. The retina was otherwise negative.

L.E.: Media clear. There was a papilledema of three diopters. The upper part of the disc was covered by hemorrhage similar to those seen in the right eye. There was a large subhyaloid hemorrhage across the lower part of the disc, extending three or four disc diameters below the disc.

Diagnosis. Subhyaloid hemorrhage following subarachnoid hemorrhage from bleeding from a metastatic tumor of the brain secondary to carcinoma of the breast.

The patient died on November 9, 1951.

Post-mortem findings. Carcinomatous metastases to the chest, skull, brain, liver, and left ovary from adenocarcinoma of the right breast which had been removed surgically in 1947. The brain metastases were to the right lobe of the cerebellum and throughout the cerebrum. There was a thin film of darkly clotted blood overlying the right parietal, temporal, and occipital regions.

The close association between the development of bilateral edema and subhyaloid hemorrhage and the taking of the ventriculograms suggests that the ventriculography was the direct cause of the intracranial bleeding.

Review of cases of subarachnoid hemorrhage

(University of California Hospital)

Forty-three patients with subarachnoid hemorrhage were seen at the University of California Hospital between July, 1941, and July, 1951. Of this number, 10 showed changes in the ocular fundi. Their ages ranged from 16 months to 54 years, and they were evenly divided with respect to sex, five being males and five females.

The fundus examination had revealed papilledema in five cases, scattered hemorrhages in two, and subhyaloid hemorrhages in three. The subarachnoid hemorrhages were due to bleeding from a tumor in two cases, to rupture of an aneurysm in five, to rupture of an arteriovenous aneurysm in one, and to unknown causes in two. Of the 10 patients, four died and six recovered.

Of the three cases with subhyaloid hemorrhage, two died and one recovered. The findings in these three cases were as follows:

1. Male, aged 54 years. *Post-mortem findings.* Rupture of aneurysm of arterial circle of Willis with subarachnoid hemorrhage; generalized edema of the brain.

2. Female, aged 37 years. *Post-mortem findings.* Rupture of a congenital aneurysm of the right internal carotid artery with subarachnoid hemorrhage; recent cerebral infarction and extensive generalized edema of the brain.

3. Female, aged 53 years. This patient was discharged as recovered two months after the subarachnoid hemorrhage. The hemorrhages had absorbed and the fundi showed grade II arteriosclerosis with slight engorgement of the veins. There were a few scattered drusen and some edema of the retina immediately surrounding the disc. The diagnosis on discharge was subarachnoid hemorrhage, probably from a congenital aneurysm from the circle of Willis.

Review of cases of leukemia studied at the Oncology Laboratory*

The histories of the cases of leukemia seen at the Oncology Laboratory at the University of California School of Medicine were reviewed. There were 77 patients with leu-

* Laboratory of Experimental Oncology, National Cancer Institute, National Institutes of Health, Public Health Service, Federal Security Agency, and the Department of Medicine, University of California School of Medicine, San Francisco.

kemia that had come to autopsy. Of this group five were diagnosed as having had subarachnoid hemorrhage. In two of the five there had been subhyaloid hemorrhage and in both of these autopsy revealed edema of the brain.

Comment

Recent work seems to indicate rather conclusively that in subarachnoid hemorrhage there is little if any free passage of blood between the cranial cavity and the orbital optic nerve sheath spaces. Furthermore, optic nerve sheath hemorrhages have been demonstrated in the absence of intracranial hemorrhage. These optic nerve sheath hemorrhages apparently originate in the rupture of veins or venous channels in the dura.

The work of Ballantyne,[10] MacDonald,[9] Riddoch and Goulden,[5] Greear,[12] Drews and Minckler,[3] Walsh and Hedges,[14] and others has disproved the old theory that the subhyaloid hemorrhage is the result of direct leakage of blood through the lamina cribrosa. In two of their cases Walsh and Hedges[14] found the central retinal vein ruptured anteriorly to the lamina cribrosa.

MacDonald,[9] Miller and Cuttino,[13] and others have regarded the retinal hemorrhage primarily as the result of compression of the central vein in the intervaginal space by the hemorrhage in the optic nerve sheaths, but the presence of orbital and intraneural hemorrhages (Walsh and Hedges,[14]) would seem to bear out the contention that the hemorrhages in the eye and other structures are the result of venous pressure transmitted from the cranial cavity to the orbital veins.

The rare occurrence of subhyaloid hemorrhage in cases of subarachnoid hemorrhage can also be explained on this basis. Walsh and Hedges[14] found that the frequency of retinal and subhyaloid hemorrhage varied directly with the severity of the cerebrovascular accident and the presence or absence of cerebral edema.

This is borne out by the three cases of subhyaloid hemorrhage seen at the University of California Hospital. The post-mortem examinations of the two who did not survive revealed brain edema and, in the cases of leukemia with subhyaloid hemorrhage and subarachnoid hemorrhage, the brains at autopsy showed edema.

Bisland and Topilow[15] reported an interesting case in which the rupture of an intraventricular berry aneurysm in the course of a toxemia of pregnancy gave rise to an extensive subhyaloid hemorrhage and to exophthalmos. It would be interesting to know whether or not the brain in this case showed edema at autopsy. In any event it would appear that the extent of the hemorrhage depends upon the extent of the venous pressure.

Summary and Conclusions

The fundus findings in two cases of subhyaloid hemorrhage occurring after subarachnoid hemorrhage are presented. One of these cases followed bleeding from a metastatic tumor of the brain, the other followed a vascular accident due to hypertension.

A review of the cases of subarachnoid hemorrhage at the University of California Hospital revealed that of the 43 cases seen between July, 1941, and July, 1951, five had retinal or subhyaloid hemorrhages. The subarachnoid hemorrhage in four of these resulted from rupture of an aneurysm and in the fifth from bleeding from a hemangioma. Two of the three cases of subhyaloid hemorrhage came to autopsy and in both there was evidence of cerebral edema.

From a review of the literature it would appear that subhyaloid hemorrhages occur as a result of increased venous pressure secondary to subarachnoid hemorrhage, the increased venous pressure being transmitted from the cranial cavity to the orbit.

The extent of retinal and subhyaloid hemorrhage varies with the severity of the vascular accident and the presence or absence of cerebral edema.

384 Post Street (8).

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Ophthalmic Miniature

I first tried this remedy (feeding of fresh bovine retinas, six to eight times a day; the extract was called "opticine"—*editor*) in retinitis pigmentosa, for it was in connection with that disease that the idea first developed in my mind. I have used it in five of these cases, and in every one of them there has been very distinct and real improvement.

Robert W. Doyne,
British Medical Journal, September 26, 1903, page 725.

Discussion

Dr. Darier (Paris) said that, after the publications of Brown-Sequard, he and many others had tried spermine in cases of optic atrophy with varied success. Later on he tried to stimulate the secretion of visual purple by injecting subconjunctivally an extract of the ciliary body, choroid, and retina. He had obtained from this encouraging results.

Mr. Sydney Stephenson had treated three cases of tobacco amblyopia with Mr. Doyne's "opticine." The result in each case was good, and showed a marked improvement in spite of the combined use of tobacco.

Ibid., page 726.

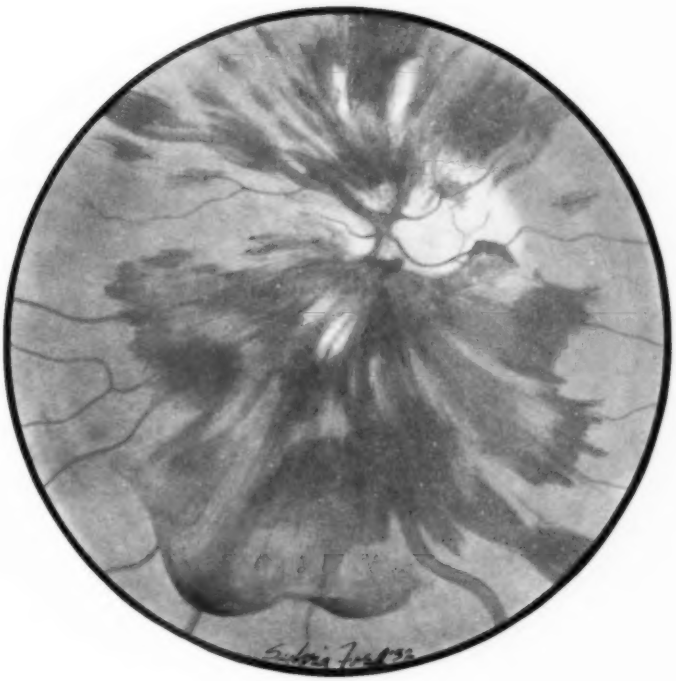

FIG. 1. CONDES: SUBHYALOID HEMORRHAGE FOLLOWING SUBARACHNOID HEMORRHAGE

FIG. 1

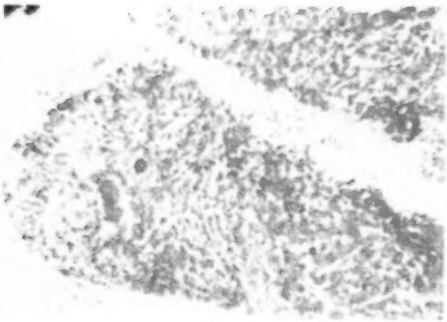

FIG. 2

FIG. 3

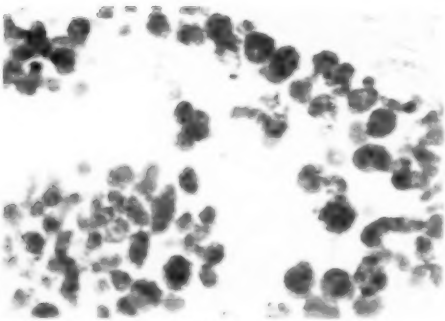

FIG. 4

FIGS. 1 TO 4 (VAIL). FIG. 1. HETEROCHROMIA. FIG. 2. NECROTIC TUMOR MASS TRANSFORMS THE CILIARY BODY. FIG. 3. TUMOR CELLS IN THE OPTIC NERVE CUP. FIG. 4. PIGMENTED CELLS IN THE ANTERIOR CHAMBER.

METASTATIC MALIGNANT MELANOMA OF THE UVEA*

A CASE REPORT

DERRICK VAIL, M.D.
Chicago, Illinois

To the 15 probable cases (Reese, Lisa and Givner) of metastasis of malignant melanoma to the uvea recorded in the literature an additional case is herewith reported.

The rarity of this condition supports the dictum of Virchow that "those organs which exhibit a great tendency to protopathic tumor formation present a very slight inclination to metastatic deposits." (Cited by de Schweinitz.) In 11 of the cases, the primary site of the neoplasm was in the skin. In the remainder, a primary tumor was found in the lids and conjunctiva of the opposite eye, one in the breast, one in the choroid of the opposite eye, and one in the ovary. The cases reported by Wiener and by Meigs and de Schweinitz are rejected by Adamük, by Wintersteiner, and by Reese as being instances of lymphosarcoma.

Indeed, the problem whether one is dealing with a metastatic tumor of the uvea or an instance of multiple origin is most difficult to determine in a disorder that can be as widespread systemically as malignant melanoma. However, if the ocular tumor occupies a position entirely out of keeping with its usual position, if isolated, infiltrated areas within the uvea are found, if the blood vessels within these foci contain cells of the same character, or if the ocular lesion occurs a considerable time after the recognition of a malignant melanoma elsewhere, it is reasonable to assume that the tumor is metastatic and not primary. Some of the cases reported in the literature may not satisfy these criteria but there is enough evidence, I think, to state that metastatic melanoma of the uvea can and does occur.

It is not necessary to review here the cases referred to in the literature. The papers by Fry and by Lisa and Givner and the discussion by Reese in his superb book *Tumors of the Eye*, adequately cover the ground. The only case that seems to have been missed by these authors is that reported by Peter in the discussion of Fry's paper.

The literature on malignant melanomas is most voluminous. Cunningham has recently reviewed this subject and concluded from the distribution of 960 cases that malignant melanomas are found most often on the lower limb (27 percent), followed by the head and neck (23.5 percent), the trunk (19 percent), and the upper limb (13.5 percent), the remainder being in the eye and elsewhere.

Pack, Gerber, and Scharnagel found rather less on the arm (8.5 percent) and more on the trunk (24.2 percent) in their series of 1,190 melanomas; but their figures for the lower limb (27.3 percent) and the head and neck (22.1 percent) are very nearly the same. In 56 or 4.7 percent of the 1,190 cases, the neoplasm was within the eye.

CASE REPORT

B. K., a white man, aged 31 years, was referred to me on March 2, 1951, by Dr. Frank J. Brown of Chippewa Falls, Wisconsin, complaining of blurred vision and discomfort in the right eye beginning about October 14, 1950. In March, 1949, he had had a small, pigmented tumor clinically diagnosed as a melanoblastoma removed from the skin of his chest just left of the midline. It is reported that the specimen was considered to be a "fibroma." Following its removal, however, a scattering of pigment occurred in the adjacent skin.

On October 9, 1950, he had a cholecystectomy performed by Dr. C. B. Hatleber and

*From the Department of Ophthalmology, Northwestern University Medical School.

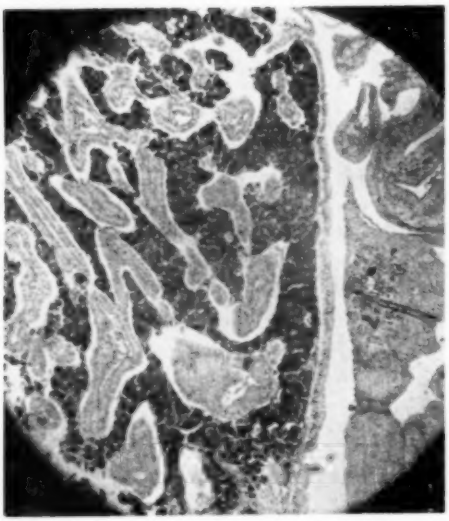

Fig. 5 (Vail). Gallbladder infiltrated with melanoma.

Dr. Charles A. Kemper at St. Joseph's Hospital, Chippewa Falls, Wisconsin. The following is the report of the tissue examination by Dr. Gordon Worley pathologist, Chippewa Falls, Wisconsin.

PATHOLOGIST'S REPORT

Specimen. Gallbladder and appendix; biopsy of pigmentation; pigmentation of omentum from large bowel.

Gross. The specimen consists of:

1. A gallbladder measuring about 9.0 cm. in length and showing foci of deep pigmentation on the serosal surface. On cut section the gallbladder wall is found to be thickened, and the lumen contains a darkly pigmented, soft hemorrhagic mass, which is firmly adherent to the wall. There are smaller foci of the darkly pigmented tissue protruding into the lumen, these areas vary from 0.1 to 1.5 cm. across.

2. An appendix measuring about 9.0 cm. in length and showing a glistening serosa. In the meso-appendix, there are multiple small foci of pigmentation.

3. A segment of fibro-areolar tissue measuring about 2.0 cm. across and showing several millimeter-sized foci of pigmentation. There is also a small pigmented nodule measuring about 0.2 cm. (tissue found in subcutaneous tissue).

Microscopic. The sections show:

A gallbladder wall in which there are melanoblastoma cells which are heavily pigmented with melanin pigment. This growth extends into the lumen. All layers of the gallbladder are infiltrated with metastatic, neoplastic cells and the serosal lymphatics are permeated with the pigmented neoplastic cells (fig. 5).

2. An appendix in which microscopic evidence of metastatic involvement is not found; however, occasional melanoblastic cells are found in the meso-appendix.

3. A segment of fibro-areolar tissue (from subcutaneous region), showing a nodule of heavily pigmented cells. This is a course brown pigment (melanin).

This patient shows multiple metastatic involvement from a malignant melanoblastoma.

Diagnosis. Metastatic melanoblastoma.

Six days later the right eye became inflamed and a diagnosis of iritis was made by Dr. Brown. This was actively treated with ACTH, cortisone, fever treatment, and so on, but the eye continued to be irritated and the vision stayed blurred.

When the patient was seen by me five months later, it was noticed that the right iris was brown and the left one blue (fig. 1). There was slight ciliary congestion. The corrected vision was 20/20−.

The anterior chamber of the right eye was deeper than that of the left and the corneal microscope showed many pigment cells and some patches of ordinary keratic deposits on the posterior surface of the cornea. There were many cells freely circulating in the aqueous, some of them large pigmented and globular.

The iris of the right eye was dark brown, splattered with pigment and mossy in appearance. There was a posterior synechia at the 12-o'clock position.

The anterior surface of the lens revealed pigment deposits and the lens itself showed no opacities. The red reflex was fair, although dark on the nasal side. The vitreous showed many floaters. The fundus was normal. The field of vision was full. The ocular tension measured 55 mm. Hg (Schiøtz).

Transillumination showed a suspicious shadow on the nasal side near the 3-o'clock position. X-ray films of the right orbit showed nothing abnormal. The left eye was normal.

There were a number of "moles" scattered about the upper trunk and arms.

A diagnosis of diffuse metastatic malignant melanoma of the uveal tract of the right eye was made, and this was considered to be the cause of the low-grade uveitis and secondary glaucoma that were present.

In view of the poor prognosis for life, the excellent vision, and in the absence of severe pain, enucleation was not advised. Local treatment was given and the patient returned at monthly intervals, during which time and until his last visit on June 22, 1951, his eye was comfortable.

At this time, the vision with correction in the right eye was 20/30, the tension 42 mm. Hg (Schiøtz), and the appearance of the eye unchanged.

On July 27, 1951, the patient was admitted to St. Elizabeth's Hospital in Chicago complaining of pain in the right eye and severe abdominal pain with vomiting. His attending physician reported that during the last two or three months "lumps" had appeared in the skin in various parts of his body.

At the time of admission the examination showed numerous elevated subcutaneous nodules varying in size from 1.0 to 1.5 cm. in diameter. The overlying skin was discolored blue-gray to black. The liver was palpable and there was some tenderness and rigidity in the epigastrium.

Laboratory tests showed: R.B.C., 3,560,000; hemoglobin 67 percent; W.B.C., 8,400.

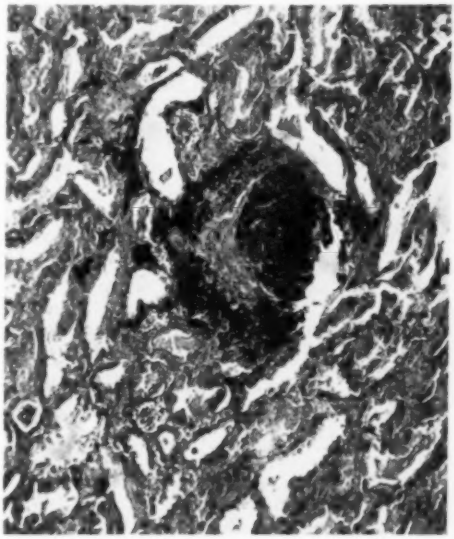

Fig. 6 (Vail). Metastatic nodule in the kidney.

On August 1, 1951, he complained of increased abdominal pressure. The sclera and skin were jaundiced. As time went on, the jaundice became deeper and more subcutaneous nodules appeared. His condition became steadily worse and on September 10, 1951, he died.

I am indebted to Dr. J. J. Kearns, pathologist of St. Elizabeth's Hospital for the following report of the post-mortem examination:

"The skin and conjunctiva were discolored a dark lemon-yellow. The eyelids of the right eye were discolored brownish black. There were numerous slightly elevated subcutaneous nodules in the skin of the neck, right arm, and trunk. The overlying skin was discolored brownish black. The abdomen was distended and there was pitting and swelling of the lower extremities.

"There was about 100 cc. of amber colored fluid in the pericardial sac and pleural cavities. The lungs were subcrepitant and dark-red blood poured from the cut surfaces. The mucous membranes of the trachia and bronchi were swollen and dusky red. The tracheobronchial lymph nodes on the right

side formed a mass 3.0 by 5.0 cm.

"The heart weighed 350 gm. The myocardium was grayish brown, swollen, semi-firm. The left ventricle contained a brownish black nodule which measured 0.5 cm. The subendocardium of the auricle and the ventricle contained slightly elevated brownish-black masses which ranged in size from 1.5 to 1.0 cm. in diameter. The cardiac leaflets, aorta, and coronary arteries revealed no change.

"The abdominal surfaces were smooth and moist. The liver weighed 1,700 gm. and there was a brownish-black area, roughly triangular in shape, in its right lobe which measured 2.0 by 3.0 cm. The remainder of the parenchyma was grayish tan and the markings were distinct.

"The spleen weighed 80 gm. and the pulp was soft, dusky red. The pancreas and adrenals showed no remarkable change.

"The left kidney weighed 100 gm. and the parenchyma was black (fig. 6). The right kidney weighed 200 gm. and the parenchyma was dusky red. The urinary bladder, prostate gland, and seminal vesicles were normal. The serous surface, visceral and parietal were studded with brownish black areas. The subcapsular areas of the adrenals and pancreas were similarly affected.

"The mucosa of the stomach, small and large bowel, the mesentery, and the periportal lymph nodes were studded with brownish black nodules. The lumen of the vena cava contained masses of friable brownish-black tissue.

"Microscopic examination of specimens of the brownish-black tissue removed from various sources revealed anaplastic cells with bizarre nuclei, many showing various stages of mitosis. The cytoplasm of many contained brownish-black granules. The cells formed islands and cords and frequently were replaced by amorphous debris consisting of fibrin, red cells, and connective-tissue cells."

I did not learn of this patient's death until the newspaper notice of it was brought to my attention by my secretary. I immediately called on the widow and persuaded her to permit removal of the eyes for further post-mortem studies.

Enucleation was performed by my associate, Dr. Robert Vickery, at the cemetery when the services had concluded and just before the body was interred. This was three days after death. The eyes were placed in formalin and later sectioned. The left eye was found to be entirely normal.

The following is the report of the examination of the right eye by Dr. Bertha Klien, pathologist of the Department of Ophthalmology, Northwestern University Medical School:

"The cornea has numerous deposits of pigmented cells on its posterior surface, but otherwise appears normal (fig. 4). Clusters of pigmented cells, varying greatly in size, also line and infiltrate the anterior surface of the iris and trabeculum. In the latter location the implantation tumor has infiltrated around the canal of Schlemm and along some of the ramus perforantes.

"There are posterior synechias along the temporal and inferior circumference of the pupil and pigment clumps on the anterior lens surface.

"The corona ciliaris on the nasal side is transformed into a dark-brown, extensively necrotic tumor mass (fig. 2). The outline of the ciliary processes has been destroyed, but the outer muscular portion of the corpus ciliaris is relatively uninvolved. The cells composing the mass are occasionally tremendous in size, either round or oblong, densely packed with pigment granules. Some vascular lumina are seen within this mass, filled with tumor cells. The location of the mass in the region of the ciliary processes suggests a metastatic tumor.

"Free tumor cells and clusters abound in the vitreous and along the inner surface of the retina and optic nerve (fig. 3). The nerve has a funnel-shaped physiologic excavation and there is an incipient glaucomatous retrodisplacement of the cribriform plate.

"The diagnosis is secondary glaucoma and necrotic malignant melanoma of the ciliary body, probably metastatic."

Conclusion

An additional case presumed to be a malignant metastatic melanoma of the uvea is added to the 15 recorded cases in the literature.

The patient's right eye was involved about 20 months after the removal of a pigmented nodule from the skin of his chest and about six days after the removal of a gallbladder reported to contain a malignant melanoma. The eye became moderately inflamed and rapidly showed a dark discoloration of the iris, which was in striking contrast to the normal blue iris of the opposite eye. Secondary glaucoma ensued.

The patient died of generalized malignant melanosis three and one-half years after the removal of the skin tumor which was reported to be a "benign fibroma." In view of the subsequent course of events, however, there is little doubt that this was a malignant melanoma.

Histologic examination of the right eye showed a necrotic malignant melanoma of the ciliary body that was considered to be metastatic, in the opinion of the ophthalmic pathologist.

700 North Michigan Avenue (11).

I am grateful to Dr. Frank Brown for referring this patient and for obtaining slides, materials, and the report of Dr. Gordon Worley.

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Ophthalmic Miniature

He first feels as if a small current of air was directed on the face; then, as it were the fillip of a finger, or the bite of a gnat; and on looking in the glass, he suddenly perceives a tumor rising on the forehead, which in the space of half an hour, becomes as large as a pigeon's egg, and as he expresses it, moves down until it closes the eye. Sometimes it attacks his lips, and other parts of his face, but never affects his nose. (A case of angioneurotic edema—*editor.*)

Robert Graves,
Clinical Lectures on the Practice of Medicine, 1843.

INTRAOCULAR BIOPSY: AN EVALUATION*

T. E. Sanders, M.D.
Saint Louis, Missouri

Biopsy is the surgical removal of a tissue specimen for histologic diagnosis. Its role in the diagnosis of neoplastic disease has become increasingly important.

Ackerman[1] has said, "It is imperative that pathologic verification of malignant tumors be present before any therapy for them is instigated." The sole means of doing this is with biopsy. Only histologic examination of tissue can differentiate a chronic inflammatory lesion simulating a neoplasm from true tumor or can give an exact diagnosis of the origin and the type of neoplasm with some idea as to its malignant potentialities.

Techniques of obtaining tissue by biopsy vary with the site of the lesion. Biopsy methods may be quite simple or very specialized and ingenious. The commonest and most useful method is the incisional or surgical biopsy, in which a specimen is removed by incising into the tumor mass.[2] In many instances aspiration techniques, in which a large needle with syringe suction is employed, are satisfactory.[3] In small discrete lesions, excisional biopsy in which the lesion is removed *in toto* are applicable. This type of biopsy is very useful in the skin.[4] In certain sites, specialized techniques have been devised, as the vaginal smear (Papanicolaou[5]), sedimentation of pleural and abdominal fluids,[6] and the use of endoscopic methods, such as the bronchoscope. Sternal marrow puncture has become an invaluable aid to the hematologist.[7] At times such major procedures as exploration of the abdominal, thoracic, or cranial cavities are employed.

The purpose of most of these procedures is to obtain a tissue specimen, although at times complete removal of the lesion is also accomplished. It is the responsibility of the surgeon to obtain an adequate and representative specimen by proper choice of the site, the extent, and the method of biopsy. As the pathologist can diagnose only on the actual tissue presented, it is essential that there be close co-operation between the clinician and the surgical pathologist.[1] This is particularly true in the eye.

A notable exception to this increased use of biopsy is the intraocular tissues. It is feasible to perform a biopsy on any of the intraocular tissues: iris, ciliary body, choroid, retina, or lens. The intraocular tissues are not, however, easily accessible, and the iris and lens are the only ones that are usually excised.

As will be discussed later, there are in the literature only a few scattered case reports of choroidal or ciliary body tumors in which biopsy was performed.[8-12] Several series of iris tumors as well as many individual cases have been reported in which some of the specimens were obtained by biopsy. There are no reports of retinal or lens biopsy. I have been unable to find in the ophthalmic literature a comprehensive discussion, with evaluation, of the role played by biopsy in intraocular disease.

Obviously there must be some reasons for this other than the apparent lack of interest of the ophthalmologist in accurate tissue diagnosis. As will be shown, there are several excellent reasons that obviously tend to limit the enthusiasm of the ophthalmologist for intraocular biopsy.

In view of the present-day status of biopsy in other surgical fields and the relative lack of information on intraocular biopsy in the ophthalmic literature, it is believed that the role of intraocular biopsy in ophthalmic diagnosis needs evaluation concerning its indications, the available techniques, the dangers and contraindications, the accuracy

* From the Department of Ophthalmology, Washington University School of Medicine, and the Oscar Johnson Institute. Presented at the 88th annual meeting of the American Ophthalmological Society, Hot Springs, Virginia, June, 1952.

of the results, and the clinical applications. This can best be achieved through analysis of a series of patients on whom intraocular biopsy has been performed.

In the files of the Laboratory of Ophthalmic Pathology, Washington University School of Medicine, there are 48 instances of intraocular biopsy. There are 40 cases of iris biopsy, six of choroid and ciliary body, and two of lens material, with no instance of retinal biopsy. The clinical aspects, the biopsy methods, and the pathologic lesions of these various tissues are so different that they will be discussed separately.

Choroid and Ciliary Body

Apparently biopsy of a ciliary body or a choroidal lesion is a very unusual procedure. In 1951 Veasey,[8] in reporting his case, stated that it was unique. However, in 1944 Alvis[9] recorded the first case of the present series.

Veasey's patient, a white man, aged 71 years, complained of monocular diplopia due to a translucent mass in the ciliary body. Because of the possibility that the mass was a cyst, a 24-gauge needle was passed into the mass through a sclerotomy opening, in the hope of collapsing the cyst and of aspirating some tissue. A core of tissue was obtained, which was diagnosed histologically as "sarcoma." In the enucleated eye a large, nonpigmented, malignant melanoma of the ciliary body was found.

Other instances of aspiration biopsy of a choroidal malignant melanoma have recently been recorded. In April, 1951, Kauffman[10] presented a case before the Section on Ophthalmology of the College of Physicians of Philadelphia. In 1950, Gonzalez, Pateyro, and Grosso[11] reported two cases of aspiration biopsy of malignant melanoma of the choroid confirmed by enucleation. They were impressed with the rarity of this tumor as the two reported cases were the only instances of malignant melanoma in 100,000 patients. Although not reported, several other instances of choroidal biopsy are known to have been performed in this country.[12]

There are several recorded instances of the use of the intraocular fluids for tumor diagnosis. Tumor cells were found in the subretinal fluid in five of six cases of choroidal melanoma by Meisner[13] in 1923. Rintelen[14] reported two similar positive cases in 1938.

Reese[15] doubts the diagnostic value of such examination: proliferated epithelial cells are not uncommon in the subretinal fluid, and the differentiation of such cells from true neoplastic cells is difficult; there are no tumor cells in the subretinal fluid in many cases of early malignant melanoma in which the lamina vitrea is unbroken.

Oxilia and Pizzetti[16] in 1950 reported two cases of malignant melanoma of the ciliary body which were diagnosed by aspiration of the aqueous humor, tumor cells being found in the aqueous by the Papanicoloau technique.

Cibis[17] in 1940 tested the subretinal fluid for melanin with iron chloride in five cases with a positive result in each. The test was negative for aqueous, vitreous, and subretinal fluid in ideopathic detachment. Although his belief was never confirmed, Cibis believed that this test possessed real value.

Because there was no tissue for examination, I have not included in the present series one case of proved malignant melanoma of the choroid, in which there were two withdrawals of subretinal fluid. The fluid was sent to the laboratory as dried film on a slide. The interpretation was most difficult; only blood cells could be identified. It should be remembered that in the accepted techniques, using body fluids for cytologic diagnosis, an examination is made of the centrifuged sediment of a relatively large amount of fluid. In the eye, in which the amount of fluid is necessarily minute, this concentration is impossible, and the technique, therefore, is much less dependable.

Considering the rarity of reported cases of biopsy of a choroidal or a ciliary body lesion, our series of six cases is surprisingly large. As these six cases constitute the chief

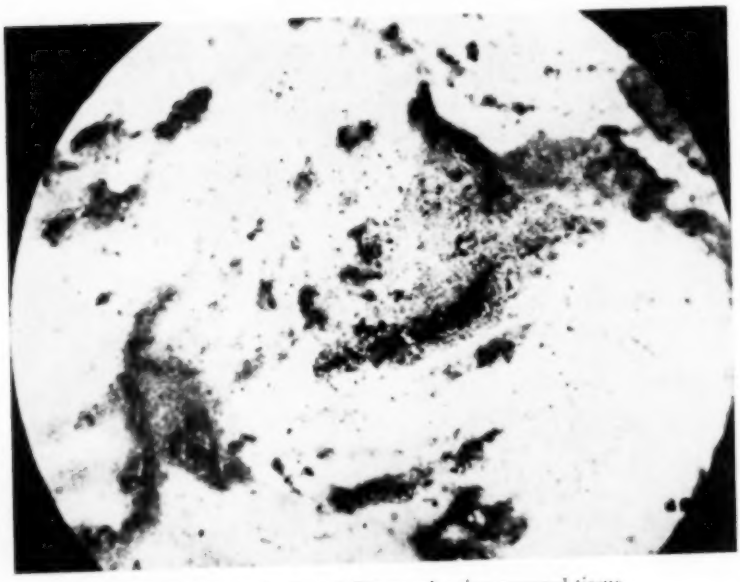

Fig. 1 (Sanders). *Case 1.* Biopsy, showing smeared tissue.

reason for this attempt to evaluate intraocular biopsy, they will be reported in some detail. Three of the six cases are choroidal malignant melanoma (Cases 1, 3, and 4), one an interesting false positive (Case 2), and two are neurofibroma of the ciliary body. These two cases of neurofibroma (Cases 5 and 6) are so interesting and unusual that they will be reported in detail elsewhere.

The pathologic diagnosis of all six cases was done by me and, in three of the cases (Case 4, 5, and 6), the biopsy was also done by me. Dr. B. Y. Alvis performed the biopsy on Cases 1 and 3, and Dr. H. R. Hildreth on Case 2. These cases are reported with their permission.

Report of cases

Case 1

H. B., a white man, aged 53 years, was referred to Dr. B. Y. Alvis on February 25, 1943. The patient reported that at the age of five years his right eye was punctured by scissors point. Since that time vision had been poor in this eye, but there was no other difficulty.

About five weeks prior to the report, he had noted some hazy vision in his left eye, which grew worse. About two months before admission, he was told by an ophthalmologist that he might have a tumor. One month later the diagnosis was changed to retinal detachment, and the patient was referred to Dr. Alvis for operation.

Vision was: R.E., 20/200; L.E., 6/200.

Right eye. Dense corneal opacity in central area of cornea in which lower margin of iris is incarcerated. Some anterior lens opacity.

Left eye. Externally normal. Ophthalmoscopic examination showed extensive bullous detachment throughout lower half from the 2- to 8-o'clock positions extending to disc. At 4 o'clock, 30 degrees outward, are two tears with some pigment proliferation around them. Tension (Schiøtz) was: R.E., 20 mm. Hg; L.E., 17 mm. Hg.

On February 27, 1943, a scleral diathermy operation was done after resecting the inferior rectus muscle. After the diathermy punctures were completed, there was no appreciable flattening of the detachment. A sclerotomy was done and no fluid escaped, even though the sclerotomy was about three-mm. deep. In the wound some dark tenacious tissue was seen. This was scraped with a blunt iris hook and smeared on a slide.

When this smear was stained, it was found to contain many large spindle cells with a clear ovoid nucleus with definite nucleolus. These cells were thought to be typical of malignant melanoma, subtype Spindle B.

Postoperatively, a large inferior detachment remained, and in the inferior temporal quadrant there was a pigmented mass elevated about 15D. Enucleation was done on March 2, 1943, and a relatively

Fig. 2 (Sanders). *Case 1.* Enucleated globe, showing extent of tumor.

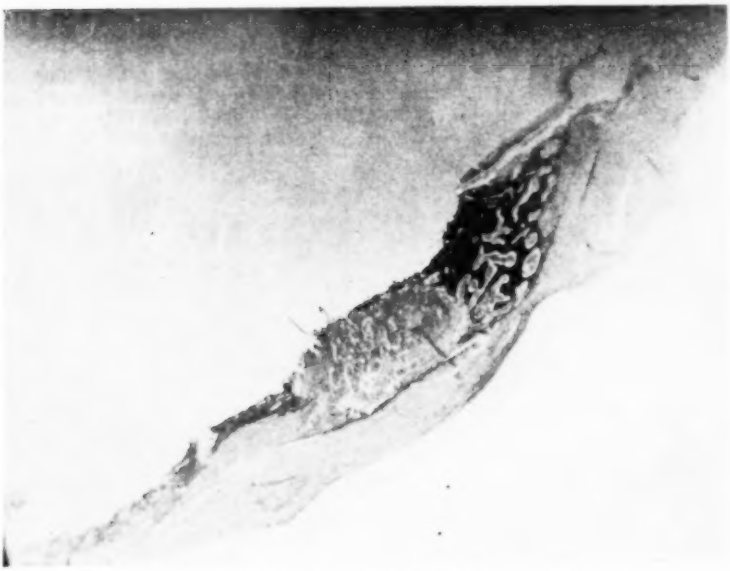

Fig. 3 (Sanders). *Case 1.* Tumor, showing effect of diathermy.

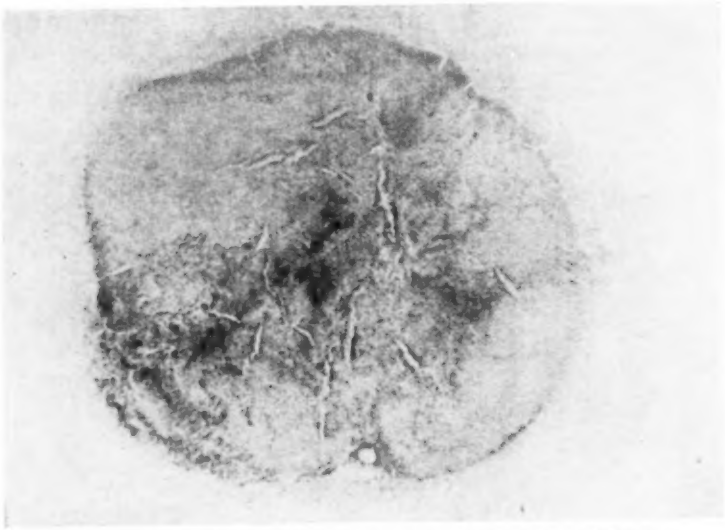

Fig. 4 (Sanders). *Case 2.* Biopsy, showing unsectioned bit of tissue.

large flat malignant melanoma was found to be present in the inferior temporal quadrant. This extended from the optic nerve to the equator. It was limited to the choroid with no tendency to rupture the lamina vitrea. The tumor mass consisted of Spindle B cells chiefly, but a few Spindle A were also present. Around the sclerotomy opening there was much necrosis, secondary to the deep diathermy punctures.

It is reported that the patient died in 1945 from cancer of the liver, probably metastatic from the choroidal tumor.

CASE 2

L. W., a white man, aged 65 years, was first examined by Dr. H. R. Hildreth on May 21, 1943. About six months before, he had noted in the left eye some fine floaters which had persisted. For the past two weeks there had been increasing visual loss in the left eye.

Vision without correction was: R.E., 20/25; L.E., 20/100.

The right eye was externally and internally normal.

The left eye was externally normal. Superior residual field. Ophthalmoscopic examination showed hazy vitreous. The retina was detached throughout the upper half from the 10- to 3-o'clock positions. The detachment extended to the disc, where the elevation was 10D. There were many fine folds over the detached area, but the peripheral margin was smooth. Two tears with some secondary retinal proliferation were localized 50 degrees out at the 1-o'clock position.

On May 23, 1943, a scleral diathermy was done over the superior sclera after resecting the superior rectus. The diathermy points were placed with a 0.5 mm. point from the 10- to 4-o'clock positions. Sclerotomy was done at the 2-o'clock position. There was some bleeding, but no fluid was presented. Sclerotomy was repeated at the 12-o'clock position and some gelatinous tissue was presented in the wound. This tissue was excised and placed on a slide.

After the tissue on the slide was stained, it was found to consist of a solid mass of round cells with some blood. Because of drying, the tissue did not stain well, but the round nuclei of a solid mass of cells could be easily seen. Although the mass could not be sectioned and the cells could not be studied adequately, it was thought that the cellular mass was a bit of prolapsed choroidal tumor, as this was thought to be the only possible cause of a solid mass of tissue under a detached retina.

Clinically the eye did poorly postoperatively, there being much reaction in the vitreous. The retina was hazily seen, but was apparently still detached. Because of the finding of solid subretinal tissue and the poor postoperative response, the eye was enucleated on May 26, 1943.

Pathologic examination of the eye showed no evidence of tumor. About one half of the retina was involved in a relatively flat detachment. Much of this detachment was adherent to an area of choroid thickened several times by edema, hemorrhage, and diffuse chronic cellular infiltration. In section through the sclerotomy, the retina was found to be prolapsed into the wound with part of the outer layers excised.

The final diagnosis was simple ideopathic detachment of retina with prolapse ofthe retina through the sclerotomy wound.

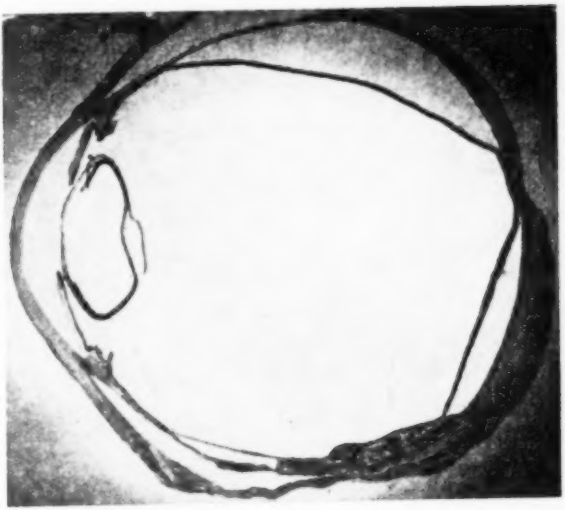

Fig. 5 (Sanders). *Case 2.* Enucleated globe, showing area of reaction to diathermy.

CASE 3

E. S., a white woman, aged 25 years, was first seen by Dr. B. Y. Alvis on December 14, 1948. She had no trouble with her eyes until blurring of the right eye was noted three weeks previously.

Vision was R.E., 20/200; L.E., 20/15.

Externally the eyes were normal.

Ophthalmoscopic examination revealed: left eye, normal; right eye, retinal detachment from the 2 to 9:30-o'clock positions inferiorly extending to edge of disc. The nasal side looked a little dark. After several days' bedrest, the retina of the right eye flattened, leaving two elevations, a smooth solid detachment nasally, and a bullous translucent one temporally. No tear was noted.

On December 21, 1948, sclerotomy was done in the area of the translucent detachment with recovery of blood fluid. Through a sclerotomy over the nasal detachment, solid tissue was recovered with a sharp curette.

The solid biopsy material was sectioned and stained. Typical malignant melanoma of the epithelioid type was found.

On December 24, 1948, enucleation was done. The specimen showed a large choroidal malignant melanoma, extending from the equator to the disc about

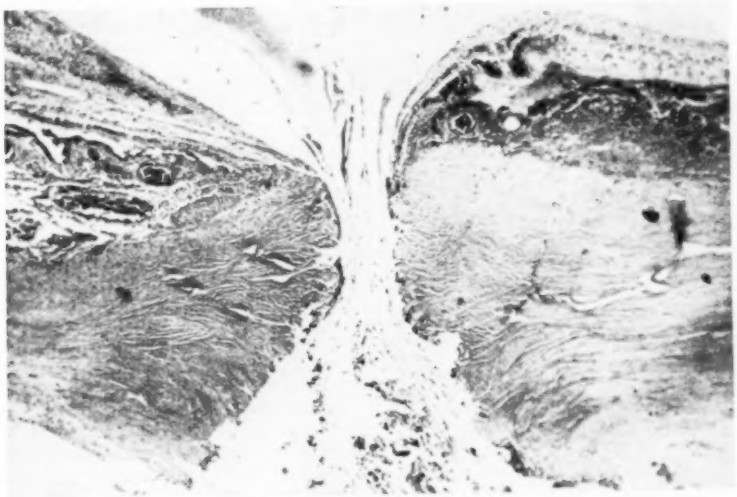

Fig. 6 (Sanders). *Case 2.* Area of sclerotomy, showing prolapse of retina.

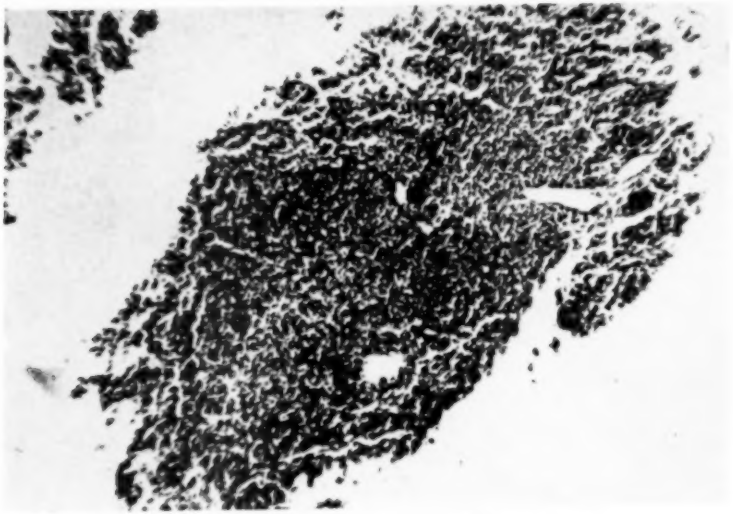

Fig. 7 (Sanders). *Case 3.* Appearance of biopsy tissue.

12 by 6 by 8 mm. in size. It was extremely vascular. The tumor was also made up of epithelioid cells.

In 1950, the patient developed carcinoma of the breast, which recurred after surgical removal of the breast. The patient died in 1951 of carcinoma, which might have been metastatic either from the choroidal or from the breast lesion.

Fig. 8 (Sanders). *Case 3.* Appearance of tumor in globe.

CASE 4

C. S., white male, aged 36 years, was first admitted to the Washington University Clinics on September 10, 1951. At the age of 12 years he had been struck in the right eye with a glass fragment. The eye was enucleated two days later. About six weeks prior to admission, the patient noted unusual lights and colors in the left eye. These grew progressively worse, and were accompanied by much flashing and wavelike motion. For two weeks there had been increasing blurring of vision.

Vision was: R.E., 20/70+.

The external appearance was normal. Ophthalmoscopic examination showed detachment of the lower third of the retina, with a sharp line of demarcation running horizontally. No tear was noted.

On September 13, 1951, a scleral diathermy operation for detachment was done, the conjunctiva incised inferiorly, and the inferior rectus resected. Transillumination showed a localized opaque area in the inferior nasal quadrant. Diathermy punctures were placed over the lower half. Sclerotomy, with an attempt to remove tumor tissue, was done by the resident. The tissue diagnosis was indeterminate.

Postoperatively, a solid mass could be seen in the inferior nasal quadrant. This was localized by the Stine technique.

On September 24, 1951, the area of previous sclerotomy was exposed by me. The mass was again localized by transillumination. Near the previous sclerotomy the sclera was again incised. In this area there was definite resistance to palpation with strabismus hook. A sharp 1.5-mm. trephine was passed into this area. No fluid escaped, but a solid core of tissue was obtained.

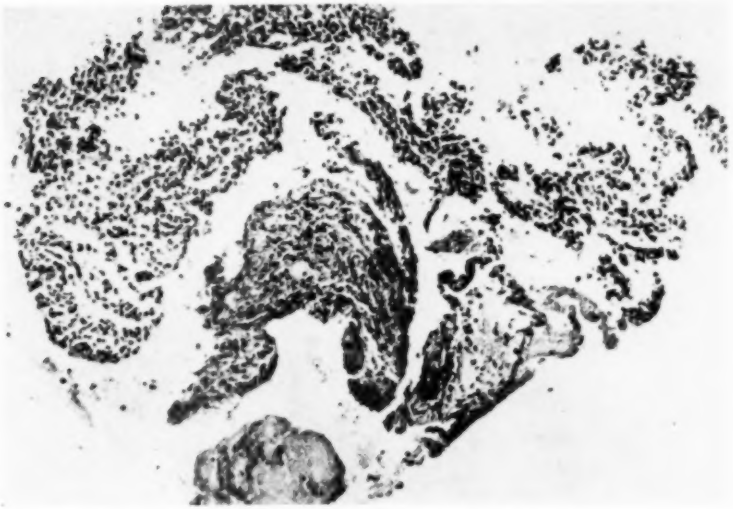

Fig. 9 (Sanders). *Case 4.* Tumor tissue in biopsy.

This biopsy definitely showed malignant melanoma of the mixed type.

Enucleation was done on September 27, 1951. The vision of the eye had deteriorated to 10/200 because of the increased retinal detachment. The vitreous was hazy, but there was no marked hemorrhage.

The specimen showed a large malignant melanoma of the choroid about 12 by 6 by 8 mm. in size, extending from the pars plana back past the equator. The retina was adherent to the tumor surface, with the remaining retina completely detached. Histologically, the tumor was the mixed type. There was some hemorrhage in the biopsy defect, but none had spread into the cavities of the eye.

CASE 5

G. D., a white woman, age 31 years, was referred to me on January 24, 1952, with the diagnosis of cyst of the ciliary body of the left eye. About 18 to 24 months prior, she had first noted "flashing and quivering of vision" in her left eye which was present intermittently. For the past six to eight months she had noted constant progressive loss of vision.

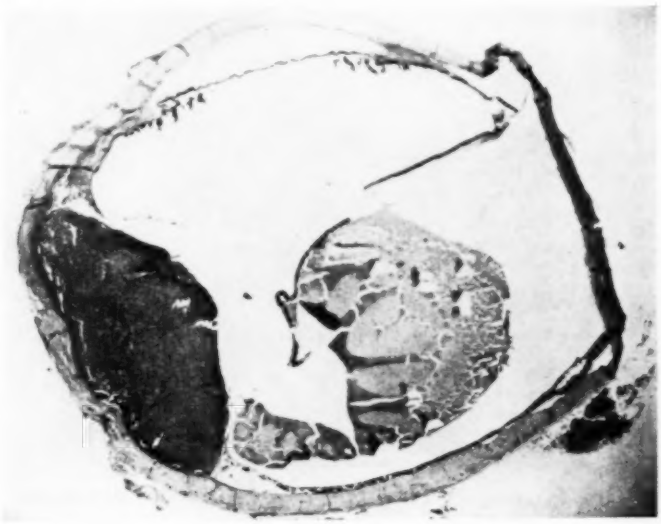

Fig. 10 (Sanders). *Case 4.* Tumor in globe.

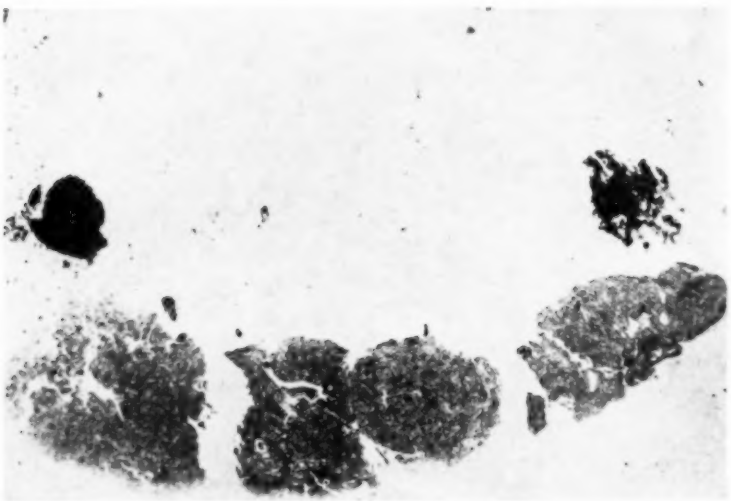

Fig. 11 (Sanders). *Case 5.* Gross appearance of biopsy section—five mm. between spots.

Vision was: R.E., 20/20; L.E., 12/200, eccentric.

Externally both eyes were normal. Tension was: O.U., 22 mm. Hg (Schiøtz). Residual eccentric field inferiorly.

Ophthalmoscopic examination revealed that the right eye was normal. The left eye had a dilated pupil, a large brown, smooth, rounded mass filled all the anterior, inferior, nasal quadrant. The upper edge of this mass impinged on the lens in the pupillary area. The disc could be seen and was of normal color with sharp outline. The superior retina was normal, but all the inferior retina was detached, but only moderately elevated.

Slitlamp examination. With widely dilated pupil, the mass could be seen almost in contact with the posterior lens surface. There was some scattered pigment on the surface of the mass, but the slitlamp beam penetrated the mass, giving the appearance of a thin-walled cyst. No vessels were noted on the surface.

Transillumination through the dilated pupil showed the mass to be practically transparent.

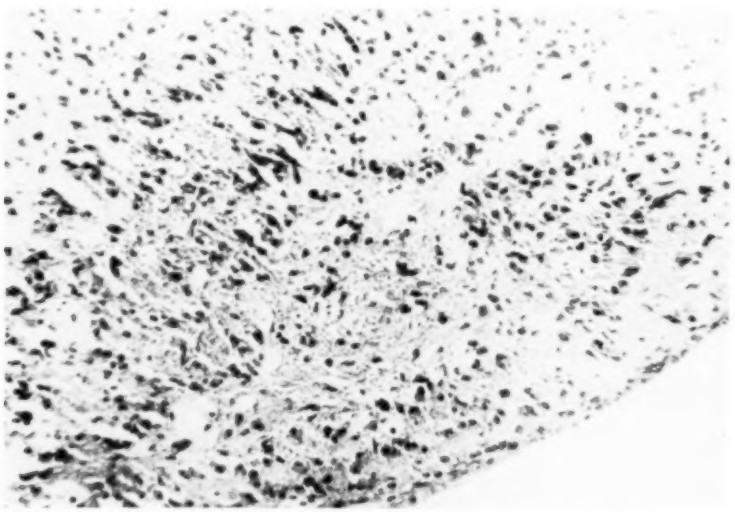

Fig. 12 (Sanders). *Case 5.* Microscopic appearance of biopsy.

Fig. 13 (Sanders). *Case 5.* Gross appearance of tumor in ciliary body.

Gonioscopic examination showed the iris angle to be open with no evidence of invasion in area of the mass.

The clinical diagnosis was a cyst of the ciliary body. Because of the detachment of retina, it was thought that the lesion could be a cystic malignant melanoma or an epithelioma of the ciliary body.

On January 31, 1952, a cyclodialysis incision was made over the area of the mass. A 1.5-mm. trephine was then passed in the direction of the cyst for about six to seven mm. When the trephine was removed, it was filled with a plug of solid white tissue about six-mm. long. No fluid escaped when the plug was removed. Under direct observation through the pupil, a probe was passed into the central area of the mass, which did not collapse. This procedure was carried out, not only to obtain a biopsy, but also to attempt to collapse the mass if it were cystic.

From the biopsy a diagnosis of neurofibroma of the ciliary body was made.

On February 4th, the eye was enucleated. On March 15, 1952, Dr. A. H. Conrad, Jr., a dermatologist, reported that the patient had three tumors of the skin that were clinically typical of neurofibroma.

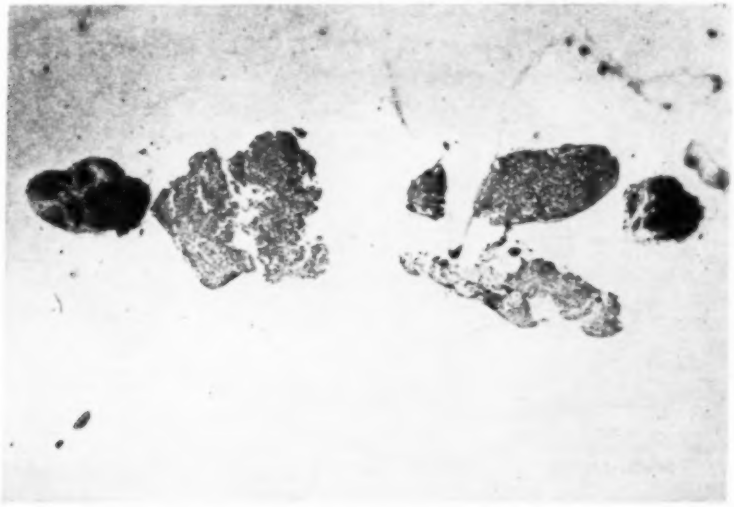

Fig. 14 (Sanders). *Case 6.* Gross appearance of biopsy specimen—five mm. between spots.

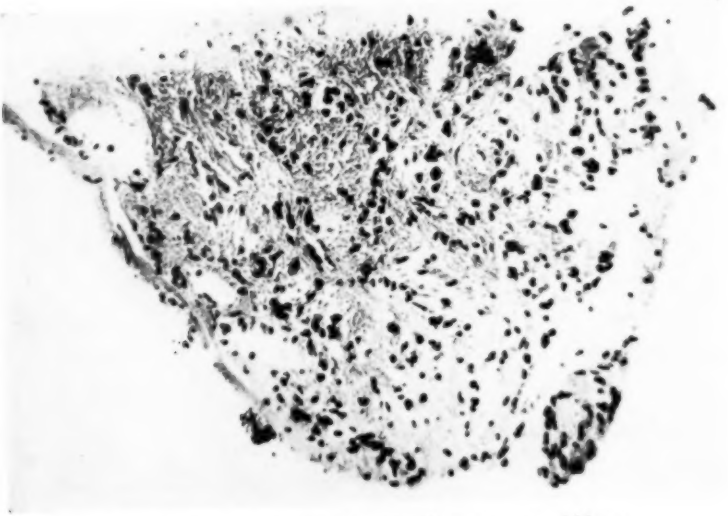

Fig. 15 (Sanders). *Case 6.* Microscopic appearance of biopsy.

Examination of the specimen showed a solid tumor replacing the ciliary body about 5 by 5 by 4 mm. in size. This extended inward to impinge on the posterior lens surface. The retina in the lower half was detached by a solid coagulum. Histologically, this tumor was identical with the tissue obtained by biopsy. The tumor mass was solid with no evidence of cyst. The final diagnosis was neurofibroma of the ciliary body.

CASE 6

V. T., a white girl, aged 10 years, was referred to me on April 8, 1952, because of a tumor of her left eye. About five months earlier, the child's mother had noted a lump on her left upper lid. On investigation, she found that this was a lump on the eyeball. This grew progressively larger, but with no discomfort, inflammation, or defect in vision.

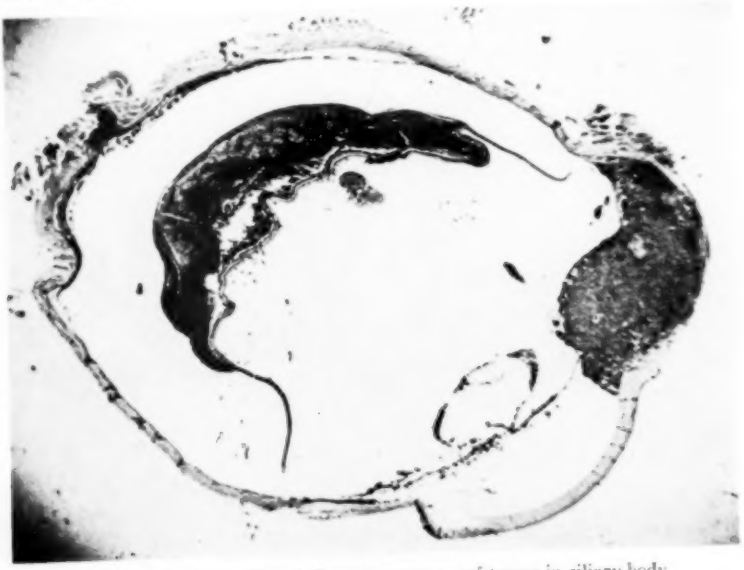

Fig. 16 (Sanders). *Case 6.* Gross appearance of tumor in ciliary body.

Vision was: O.U., 20/20.

Right eye. Externally and internally normal.

Left eye. The left upper lid looked full. When the globe was rotated downward, an oval mass was seen in the superior sclera at the 12-o'clock position. This mass measured 10 by 12 mm. in size, extending backward from just outside the limbus. It was well circumscribed and elevated about five mm. There was no inflammation or injection. The surface of the mass was slightly dark, but was crossed by many translucent bands of stretched sclera. At the 12-o'clock position in the angle opposite the edge of the tumor there was a reddish mass about three mm. broad, which extended about two mm. on the posterior surface of the cornea.

Slitlamp examination showed the mass to be very vascular and slightly translucent, with no pigmentation. The anterior segment was otherwise normal. Fields were full. Tension was R.E., 15 mm. Hg (Schiøtz); L.E., 17 mm. Hg.

Ophthalmoscopic examination. Media clear; fundi normal. No mass could be seen anteriorly. Mass did not transilluminate. There was no take-up in tumor of either radioactive iodine or phosphorus as shown by Geiger counter.

Gonioscopic examination could not be done, as the mass prevented placing the contact lens.

The diagnosis was tumor of the ciliary body, of undetermined type. The possibilities considered were malignant melanoma, ciliary epithelioma, lymphoma, neurofibroma, hemangioma, or tumor of the superior rectus tendon.

On April 11, 1952, a biopsy was done. The conjunctiva was incised radially along the nasal edge of the mass. The next tissue incised was definitely scleral fibers. As incision was completed, a bright red, plaquelike mass presented in the wound. As this tissue was excised with scissors, much vitreous was lost with marked bleeding. Incision was closed with two scleral sutures.

The biopsy was identical with that of Case 5 and was diagnosed as neurofibroma. No evidence of neurofibromatosis of the skin was found by Dr. A. H. Conrad, Jr.

Enucleation was done on April 15, 1952. A tumor 7 by 5 by 5 mm. in size was found replacing the ciliary body on one side. This extended from the ora serrata into the iris angle and invaded the iris root. It had caused an elevation of the overlying sclera, which is extremely thin. There was hemorrhage in the vitreous, under the retina, and under the choroid. The tumor tissue was very vascular and was histologically a neurofibroma.

Comment

It is apparent that the ophthalmologist has neglected intraocular biopsy for several reasons: the lack of an accepted technique; belief that the biopsy procedure might be excessively damaging to the eye; fear of dissemination of the tumor from manipulation during the biopsy; and the apparent lack of real value of the procedure in the usual case of suspected intraocular tumor.

Although there is no routine technique for intraocular biopsy, that used in the few previously recorded cases was almost exclusively aspiration. It is surprising that in none of our six cases was this method used. In Case 1 a smear technique was used, but in the other five some variation of the incisional biopsy was performed. Actual incision was done in Cases 2 and 6, curettage in Case 3, and a tissue core was trephined in Cases 4 and 5.

In the first two cases the biopsy was done more or less by accident during an operation for retinal detachment in which abnormal tissue was presented in the sclerotomy wound. Nevertheless, these cases are true biopsies, as the tissue removed represented a surgical biopsy. In Case 6 the original operation was also primarily a scleral diathermy for retinal detachment with the tumor mass found by transillumination. In the remaining instances the procedure was a planned biopsy.

After considering the technical problems involved in these six cases, it is apparent that there are two essentials in obtaining a proper biopsy of a posterior uveal lesion. In ciliary body lesions the problem is simpler as these lesions are more accessible.

First, the site of the biopsy must be carefully chosen by accurate localization of the lesion. This was accomplished in all the present cases by using several methods. In all cases a careful ophthalmoscopic examination was done, not only for diagnosis, but also because this examination is essential for localization of the lesion. In certain instances the Stine technique of localization of retinal tears can be used with value. Transillumination is also essential, particularly by the transscleral method, after incision of the conjunctiva. However, it should be remembered that a negative transillumination does not necessarily rule out tumor (Case 5). Often the base of a solid tumor can be pal-

pated through the sclera as an area of resistance to a tip of a strabismus hook. This procedure was valuable in Case 4. This method has been previously described.[18]

Second, the technique must be such as to obtain an adequate specimen. Except for the first attempt in Case 4, this was accomplished very satisfactorily in all of our cases. In each case a small but very adequate piece of tissue was obtained except in Case 1. Although aspiration biopsy is apparently a simple, nontraumatizing technique, it does not recover an actual piece of tissue, so that the diagnosis must be made more on the appearance of the individual cells, as the architecture of the tissue is destroyed. This is also true of the smear technique as used in Case 1. Undoubtedly, some variation of the incisional biopsy is probably the most effective method of obtaining a specimen, the exact technique being adapted to the clinical findings in the individual case. The greatest potential hazard in any biopsy is the inadequate specimen that gives rise to a false negative.

If the biopsy is to be accepted clinical procedure, the operative injury following it must be a minimum. Although incisional biopsies were used in all our cases, damage from the biopsy occurred in only one (Case 6). In this case there was extensive, intraocular hemorrhage in the vitreous, under the retina, and in the choroid. This was not so much due to the method of biopsy as the extreme vascularity of the tumor. Although no eye in this series was saved, the eventual loss was due to the type and extent of the pathologic lesion and not to any damage inflicted by the biopsy procedure. Even in Case 2, when the eye was removed following a false positive report, the eye was already surely lost. The prolapse of retina through a sclerotomy wound in detachment operation is an unusual occurrence, but the incarceration of retina itself would probably have led to loss of the eye even if the prolapsed tissue had not been removed for biopsy.

Dissemination of the tumor by metastasis, as well as local extension following rupture of the capsule following the manipulation of biopsy, has long been a subject of discussion. This was the chief objection to biopsy in its early stages of development. However, at present there is a general feeling that, if properly done, biopsy does not particularly increase the chances of metastasis.[1, 2]

Reese[19] has stated that, almost surely in any malignant melanoma of the choroid, tissue cells have gained entry into the circulation, but it is the ability of these cells to undergo independent growth that is the chief factor in metastasis. Even in cases of malignant melanoma that have undergone extrascleral extension before enucleation, orbital recurrence of the tumor is rare. Therefore, it would seem unlikely that the biopsy incision would be a factor in local spread, particularly since the globe is promptly enucleated if the biopsy is positive. However, although possibly a coincidence, it is hard to disregard the fact that two of these patients died of liver metastasis.

From this experience with biopsy of posterior uveal lesions, it must be concluded that the procedure has few, but definite, indications. Biopsy probably should be an essential procedure in most cases with a suspected tumor in the only seeing eye (as in two of our patients). In certain individuals who refuse enucleation on clinical examination only, it might be the means of forcing a necessary removal of an eye with tumor, this also being so in Cases 1 and 3.

Biopsy is also useful in establishing an accurate diagnosis in tumor-suspect patients who present unusual clinical findings, as surely was the case in all six of these patients. In an occasional case the clinical picture is so obscure that every resource, including biopsy, may be necessary to obtain a true diagnosis. It must be emphasized that biopsy should never be a routine procedure and should only rarely be advised, depending on the clinical findings in the individual case.

From the standpoint of actual clinical value, it probably will never become a common, or possibly even an accepted, procedure. It is difficult to see how this proce-

dure could save a globe. A positive finding, of course, will always lead to an immediate enucleation. In a case with negative biopsy findings, a reasonable doubt as to the accuracy of the biopsy might force an enucleation because of fear of a retained malignant tumor.

The value of the procedure is also markedly reduced because most eyes in which biopsy might be considered are so damaged by the original lesion that enucleation is inevitable. In these cases, a biopsy merely subjects the globe to an unnecessary procedure. As will be seen, in contrast to iris lesions, the value of biopsy in posterior lesions is minimized for none of these lesions can be excised.

The ideal case for this procedure would be a lesion that could be destroyed, as the small, circumscribed tumor of the posterior choroid with excellent vision. If proved to be one of the less malignant types of malignant melanoma, eradication by diathermy could possibly be attempted. This method has been described by Weve,[20] and the extreme necrosis obtained by diathermy is demonstrated in Case 1.

A simple accurate microchemical test for melanin that could be run on small amounts of subretinal fluid routinely removed at all retinal detachment operations would surely be of much value.

Iris

The iris has been the only intraocular tissue on which biopsy has been a generally accepted procedure. The indicated treatment for most localized, discrete iris masses has been removal by iridectomy. This may be a true excisional biopsy, as complete removal of the mass is often accomplished. A great variety of pathologic lesions have been removed by iridectomy. However, no evaluation of such a procedure for these various lesions could be found in the literature.

The present series of iris biopsies consists of 40 specimens: malignant melanoma, 11; inflammatory pseudotumor, three; leiomyoma, one; epithelial implantation cyst, eight; intraepithelial cyst, one; and incidental removal, 16.

The last group consists of iris specimens removed by iridectomy during other surgical procedures, such as cataract extraction or glaucoma operation. Often there was a history of pre-existing iritis. The histologic examination proved to be of no particular value or interest either clinically or pathologically. Unless there is some specific reason for sending such a specimen to the laboratory, it is probably a waste of time for both surgeon and pathologist.

The most important lesion in this group is the malignant melanoma. Of 17 malignant melanomas of the iris in this laboratory, eight had removal of the tumor by iridectomy. This compares with Reese's[21] series of 23 cases with 19 enucleations and four local excisions. In our series of eight excisions, subsequent enucleation was necessary in four, as from the examination of the iris specimen it was evident that the removal was incomplete. The remaining four cases have remained well. Reese divides these tumors into three types: a localized tumor mass; a localized tumor mass with one or more benign foci; and a diffuse growth with widespread involvement. Although the last type must be enucleated, the first two types are suitable for excision.

Leiomyoma is represented in this series by one case. Heath[22] states that these tumors are always benign and that they arise near the pupillary border from the iris sphincter. For both these reasons they are ideal for local excision.

Cysts are represented in this series by one case of intraepithelial cyst of iris formed by a splitting of the pigment epithelium of the iris and by eight cases of implantation cyst, three of which followed surgery and five of which followed perforating injury. Three of these cases had subsequent enucleation because of recurrence. As both types of cysts are benign, attempted local removal is usually indicated.

Of particular interest are the three cases of inflammatory pseudotumor. One case was

granulomatous, probably sarcoid, while the other two were non-specific inflammations. These cases probably represent globes that without local excision and subsequent histologic examination would have been enucleated. Irvine and Irvine[23] have recently used aspirated aqueous in the study of anterior uveitis; this is comparable to the use of subretinal fluid mentioned previously.

The technique of removing an iris tumor by iridectomy has recently been well described by Reese[24] and by Heath.[22] Both stress a large incision that can be separated so that the tumor does not touch the wound edges while it is being delivered. After delivery, radial incisions on either side are placed well out in the normal iris stroma. The base is then torn free.

After the tumor is excised, it is helpful to the pathologist if the tumor is spread on filter paper or on a cork. This keeps the iris flat until fixed so that the sections can be made radially. In two of our cases this orientation was most important in determining complete removal, as tumor tissue was found in the cut base of the iris.

From both the clinical and pathologic aspects, the only real contraindication for this procedure is the presence of other tumor tissue in addition to the localized discrete lesion. This can be diffuse spread in the iris stroma, extension posteriorly into the ciliary body, or the presence in the angle of separate disseminated tumor nodules.

In general it can be concluded that iris lesions are ideal for excisional biopsy for four reasons:

First, they can be accurately examined not only with the slitlamp, so that the nature can be evaluated, but also with the gonioscope to determine the involvement of the iris base and ciliary body.

Secondly, they can be easily and completely removed without damage to the surrounding tissues.

Thirdly, the site of removal is easily observed for evidence of recurrence.

And in the fourth place, tumors of the iris are relatively benign, many being cysts and pseudotumors.

Also there is excellent evidence that the malignancy of malignant melanoma of the iris is definitely less than that of this tumor elsewhere in the uvea. Callender, Wilder, and Ash[25] in a series of 32 cases found a mortality of only 9.4 percent. Only three of their cases had local excisions, but these were successful. Reese[26] believes that this low mortality is due not only to the nature of the tumor, as some of them are probably benign melanomas or nevi, but also to earlier detection.

From this series the value of excisional biopsy in the proper management of an iris lesion is evident. A number of eyes were retained which without this procedure would probably have been removed. Conversely, several enucleated eyes with excellent vision have been examined by me which could have been saved by a simple excisional biopsy. Among these are a small malignant melanoma involving only the pupillary border of the iris, an intraepithelial cyst of the ciliary body which was removed as a malignant melanoma and a malignant melanoma of the iris, removal of which had been suggested, but refused, 25 years prior.

Retina

There are no instances of retinal biopsy on record. It is inconceivable that any attempt at biopsy would be made on any retinal lesion other than a large mass. On a very small lesion the problems of localization and damage could be most difficult, the knowledge gained through biopsy probably being not worth the risks. Theoretically, biopsy might be considered for exact diagnosis in a massive lesion resembling retinoblastoma.

There are several reasons why biopsy should not be attempted on such lesions. Retinoblastoma is a rapidly growing malignancy that tends to remain localized inside the globe until the optic nerve is invaded. Any sclerotomy made for biopsy might well

be the path of invasive spread into the orbital tissues. Even if the lesion were not a retinoblastoma, I have shown that in such pseudogliomas the globe is hopelessly damaged by the process causing the pseudotumor.[27]

It is generally and correctly accepted that any such eye should be promptly removed. This attitude of not temporizing with such lesions is the reason for the complete lack of retinal biopsy. It must be concluded that biopsy of any suspected retinoblastoma is definitely contraindicated.

Lens

It was early recognized that no worthwhile information was gained from the histologic examination of cataractous lenses removed at operation. Much information has been gained by the chemical examination of such lenses, but this is not biopsy.

In the present series there are two biopsy specimens of lens remnants. Both of these were removed by capsulotomy following an original difficult and complicated cataract extraction. In neither case was any information of value derived from the histologic study. The recent work of Irvine and Irvine[23] suggests that study of surgically removed lens remnants might be useful in the study of lens-induced uveitis.

Biopsy is of particular value in neoplastic disease, which is characteristically absent in the lens. The reasons for this have been discussed by Sachs and Larsen.[28]

Conclusions

As would be expected, the various aspects of intraocular biopsy vary with the tissue involved. The procedure is extremely valuable in the management of iris lesions, of very limited use in the choroid and ciliary body, usually useless in lens material, and definitely contraindicated in retinal lesions.

If the iris lesion is discrete and localized, excisional biopsy is the treatment of choice. This is true in all types of iris lesions, even the malignancies, if complete removal is feasible on clinical evidence and if pathologic examination confirms the accomplishment of this.

Although biopsy of a choroidal or ciliary body lesion is technically more difficult, it usually can be accomplished without undue damage to the eye. The lesion must be accurately localized and a technique employed by which an adequate specimen is obtained. It may be indicated in one-eyed individuals, in patients with a clinically unusual lesion, and in patients in whom histologic confirmation of tumor is essential to obtain permission for enucleation. Its value is limited, as no choroidal or ciliary body tumor can be removed from the eye, even if removal is indicated by the biopsy findings, and as the original lesion is usually so damaging that enucleation is inevitable.

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FOVEAL CO-ORDINATION*

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It was with a great deal of pleasure that I accepted the invitation to take part in the program honoring Dr. Lawrence Post. He is my idea of the ideal ophthalmologist and perfect gentleman.

Because of Dr. Post's profound interest in the extraocular muscles, I asked that I be allowed to present some material that we have been gathering at the Kresge Eye Institute in our study of foveal co-ordination. During the past 30 years, I have been extremely interested in foveal co-ordination, and more specifically in the effect that it has on the individual who does not enjoy complete co-ordination.

So much has been written about the extraocular muscles that it seems rather trite for me to attempt to present a different thought on this very complex, compound subject. It is really an anatomic, physiologic, psychologic complex and there are so many factors involved that one loses himself in theory long before the practical thoughts have been tried and settled.

The entire problem is shrouded in the mystery of the fovea, its sensitivity levels, its relative superior and important recording center in the brain, and finally the development of the fusion center.

This discussion will refer only to two-eyed people. The one-eyed individual with a good fovea learns by experience the sense of depth, width, and height, and carries on a perfectly normal existence within his visual limitation.

The two-eyed individual is entirely different, the second eye being extremely important whether it has a complete fovea or not. The absence of the fovea or its complete loss is of much more value to the indi-

* From the Kresge Eye Institute.

vidual than a fovea that is partly lost or only partly interfered with. In our special study of foveal co-ordination which we began some four years ago, it became immediately apparent that we could not use the older group of individuals because of secondary psychologic changes that interfere with primary visual learning.

Muscles involved

There are actually three sets of muscles involved in vision as it relates to the fovea:

The first is the ciliary-iris combination, the iris cutting down the stray radiation, and the ciliary muscle fixing the sharpest image on the fovea and only on the fovea.

Second, are the extraocular muscles which place the fovea in position and, once both foveas are set to observe, especially for panoramic observation, the neck muscles carry out and allow a binocular foveal fixation arc of better than 180 degrees.

The only and entire function of the extraocular muscles is to fixate the fovea. They are unable to move the eye for any other reason. They cannot maintain fixation of any part of the eye except the fovea and they are under the complete direction of the fovea at all times. The entire musculature that is associated with the eyes is, anatomically, much more than sufficient and, physiologically, is capable beyond the greatest normal requirements of all normal foveas.

Third, the neck muscles, of which there are 22, are also more than sufficient for the need.

It requires tremendous excess use of the ciliary muscles, extraocular muscles, and neck muscles to produce discomfort due to normal muscle fatigue.

Early observation of the foveas in the newborn shows a diffuse nonvascular area, even less differentiated than we see in the adult, but it is a fovea that is equal to the brain capacity of the individual. Its development physiologically depends on the requirements or demands of the individual.

It would be well to mention at this time the psychologic study that we have been making on these young individuals in the hope of ascertaining with what mental level we are dealing.

In the first place, the psychologic tests that have been heretofore used are of little or no value, and our first group of so-called child psychologists gave us so much faulty information that we could not use it in our statistical study.

It was a hit and miss campaign, mostly on the miss side, for a very good reason. Child psychologists have centered most of their interest in study on visual tests. The group that we were interested in already were having difficulty with their vision. I believe that I can honestly say that our initial psychologic studies did not help us in arriving at a good conclusion.

Psychologic study

Our second year's studies were definitely better because the psychologists were forced to evolve tests that would reveal certain visual memory patterns. Now we are beginning to find out the approximate intelligence level of these young children when they enter school.

The reason for this psychologic study is that, over a period of years, keeping very accurate studies of the end results of ocular muscle surgery, I have been embarrassed and chagrined many times by the tendency of the foveas to revert to their previous positions. The central vision in the operated eye is not maintained and, although the youngster is somewhat improved, many are unable to carry on in school at an intelligence level equal to their age and normal social group.

There has been and is something drastically missing in our handling of the normal so-called muscle problem. Over a period of years, the records of these cases have been reported visually in a photographic way without records as to their fusional end results, not taken at periods long enough after the surgery has been instituted to warrant listing them as cures.

From this study of my own statistics, for

the sake of the record, I might say that I have cosmetically straightened 80 percent of my cases, at least giving them a good anatomic correction. This is truly a cosmetic result and has little to do with the physio-psychologic-intellectual level of the individual upon whom the operation has been performed. By chance, and with some orthoptic treatment, about 10 percent of this group has been held in second-grade fusion and less than 10 percent in third-degree fusion.

It was my contention as long as 20 years ago, that, unless we carried these patients completely to third-degree fusion and unless they could hold this fusion over long enough periods of time with good fusional amplitude, we were developing our own group of neurotics, our own group of people who had nervous breakdowns, and people with inferior intellectual abilities.

When I came to Detroit I was able to interest the Kresge Foundation in making a basic study on the visual levels of children in the school ages, and we started with those in high school, intermediate school, and the grade school.

Findings

It became apparent to me almost immediately that, by the time these youngsters entered the first grade, their visual pattern had become very well set and we were going to have a great deal of difficulty in making any change in it. During the past two years, we have limited our study to those children in the grade schools whom we had studied previously; those who were having difficulty in school and were behavior problems. With a team of child psychologists and orthoptic technicians and an oculist, we have made as complete an ocular study on individuals as is possible under our present-day knowledge. We are now seeing babies as young as four weeks and others up through the preschool group, as well as those in the lower grades through the sixth-grade level.

It is apparent to me now that each eye develops its own foveal-muscular brain pattern and, as the vision in the fovea develops, progress of the central foveal area parallels it. As the two eyes reach a fairly level state, the two foveas must be co-ordinated and establish a central fusion center. This may well be the first level of higher intelligence.

The individual eye pattern is a firmly developed one, and each eye establishes its own eye-brain pattern with a firmness with which it is difficult to interfere.

These patterns are just as definite in the negative phase as they are in the positive phase. By that I mean, when the pattern is not one of fusion or of co-ordination, children are just as definite in maintaining the faulty inco-ordination as they are the so-called co-ordination. With this state existing, it becomes immediately apparent that the eye-brain pattern, once firmly established, is very difficult to correct or to change and the importance of the normal physiologic state becomes more and more important.

The ciliary muscle, the shape of the iris, and the foveal sensitivity are all paramount in the establishment of normal fusion patterns. The stimulation through the fovea then directs the extraocular muscles and, except for the occasional case of myositis or other anatomic muscle changes, the entire pattern is one directed by normal foveal fixation.

Early diagnosis

Early study of the fovea is extremely important to ascertain whether one is dealing with a normal anatomic fovea or one that has been interfered with or has a congenital defect or something that will retard the normal visual increase as the youngster develops.

Foveal co-ordination starts at an early age. We have been able to spot it in youngsters at the age of 28 days, at which time a youngster will fix on simple objects with both eyes simultaneously and hold fixation. If at this time the youngsters should learn not to hold fixation, they will be just as definite in not holding fixation as they are in holding

it, and the deviations become as apparent and as direct as does the tendency to hold the normal eye-brain pattern. The correcting mechanisms must start at this time.

If the individual is allowed to establish firmly the incorrect eye-brain pattern, the problem becomes increasingly difficult as time elapses. After a period of a few years, it becomes completely impossible to obtain a perfect fusional result. Interruption of the incorrect foveal muscle brain pattern must take place as near the time of onset as is possible. The longer one waits the less the opportunity.

With a realistic approach to foveal co-ordination it makes it possible to give a logical sequence of events to the many psychologic deviations that we find in these individuals.

First, it is apparent that a baby learns by visual imitation. He watches and attempts to perform with his normal co-ordination. When both foveas act simultaneously, the co-ordination reflex becomes complete. Without completion, there must be a certain amount of hesitancy, inaccuracy, and a definite amount of mental disturbance.

It is my belief that many of our psychologic "offshoots," inferiority complexes, and the like are secondary to whatever lack of foveal co-ordination the individual may have. As the deviation persists, it regulates the individual's inability to co-ordinate the hands, to walk, and, indirectly, to speak.

It also seems quite likely that because of the visual uncertainty, should the youngster be fortunate enough to have a normal pair of ears, he may substitute hearing as his basic pattern for learning, and this substitute may become so firmly fixed that it forms a barrier to our re-education of the visual pattern. The individual has become primarily an auditory learner. Lack of concentration, a short span of attention, inability to learn to read visually are all part of this lack of foveal co-ordination, and the future pattern for the individual is set long before he enters the first grade of school.

Incidence

Our findings indicate that 20 percent of the preschool group have some lack of foveal co-ordination. Some of these children, through ocular development, lose their accommodative difficulties to a great extent, and some of them take on convergence insufficiencies which definitely increase during the first year in school. Among the preschool group, many muscle errors that were only relative now become fixed and permanent.

Correction

Those errors that are associated with the muscle of accommodation are the best handled and can be completely corrected in most instances without surgery. Those in which there has been a diminution in vision usually can be corrected without surgery if the one fovea can be restored to normal level.

If surgery is necessary, it does not have to be too profound. Interference of the spastic or overstimulated muscle will suffice. Once this has been accomplished, however, re-education must take place immediately and must be done very thoroughly.

The amount of recession, resection, or tuck is only of importance as it relates to the interference of the eye-brain pattern. If the foveas have been equalized in vision or nearly so, one interrupts the major deviation, and then by as much visual impact as possible re-educates the youngster in the normal visual pattern as completely and thoroughly and as early as possible after the surgery.

If the youngster does not co-operate or the family co-operation is poor, it is only a short period of time before it is impossible to re-educate the youngster and the tendency for the deviation to revert to its previous position or to acquire some other deviate position commences almost at once.

The earlier we are able to interrupt the faulty muscle-brain pattern, the less difficulty in developing fusion.

Surgical, or other, correction that does not

complete vertical fusion must be completed by prisms. The foveal center does not tolerate vertical diplopia. As knowledge of the fovea with its irregularities and deficiencies increases, improvements achieved through teaching will be more permanent.

As is generally known, all general infections apparently affect the sensitivity of foveal co-ordination, some much more than others. It does seem that certain diseases, such as chicken pox and measles, have a very definite effect on foveal sensitivity. Whether it is the cerebral fovea or the ocular fovea, we are unable to ascertain definitely, but that certain of the viral diseases affect foveal sensitivity is definite. In the light of our present knowledge and statistical end results, it becomes apparent that further studies on this should be made as early as possible.

When the foveal level is ascertained, one can then differentiate those cases in which there is a possibility of getting good fusion or some fusion from those in which it is primarily essential to operate only for cosmetic results.

Finally, there are those patients who have wide angles of deviation and faulty secondary reflex patterns that may have a definite deleterious effect on the nervous system.

The vertical errors are extremely important and must be corrected within one degree or as nearly completely as possible. In those cases in which this level of correction is not reached, vertical prisms must be prescribed. The development of the fusion center is almost impossible without good vertical co-ordination. The eyes cannot tolerate vertical diplopia in any shape, form, or manner.

Development in later life

The psychologic study of these individuals has raised our interest in finding out what happens to these people as they go on to higher levels of study. Apparently, they all do fairly well up until the second and third year of high school when they become disinterested; many of them leave school and others fail to reach college level.

Those who are fortunate enough in associations or determination can make college but do not make records which place them in the first third of their class. They have much difficulty scholastically and socially. A very large number of them have nervous breakdowns during the semester examinations; others become deviates in behavior because the span of attention is so limited.

It is my contention that complete foveal co-ordination that is constantly maintained is the most important learning sense of the individual.

Summary

1. Complete and constant foveal co-ordination is the most important learning sense.

2. Any vertical inco-ordination must be corrected to within one degree or less.

3. The foveal vision level must be nearly equal to 20/20, or to the highest level of vision for both eyes, or true co-ordination cannot be obtained.

4. The second eye must be better than 20/40 in order to establish complete foveal co-ordination. The earlier the inco-ordination is diagnosed and the more complete the foveal education, the more complete will be fusional end results.

5. Foveal stability depends on the fusional amplitude. The greater the amount the more stable the individual.

6. Re-examination and intermittent training may be necessary for a long time after its establishment to maintain a stable foveal co-ordination.

The key to successful re-education is to build an individual's use of the foveas, which means an early diagnosis and re-education to precede and follow the muscle surgery, if that is necessary, which in reality is only a means of interrupting the faulty eye-brain pattern.

David Whitney Building (26).

A TECHNIQUE FOR TOTAL BIOPSY OF NEOPLASMS OF THE IRIS

REPORT OF A CASE OF EXCISION OF A LEIOMYOMA

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Sanders[1] has recently reported on a relatively large series of 40 excisional biopsies of the iris. Of this group only one was a leiomyoma. In 1948, Moulton and Moulton[2] reported that they had found only seven cases of leiomyoma of the iris in the literature and that they added one case. Laval[3] advised me that he had looked up these cases and has found that most of them had been subjected to enucleation since they were regarded as malignant neoplasms.

O'Day[4] reported a case of leiomyoma in 1949. Sanders[1] reported another one in 1952. Friedenwald, et al.[5] speak of several other cases.

I excised a leiomyoma of the iris in 1946 and am reporting it since (1) it is now nearly seven years since the operation and there are no signs of any recurrence, the lesion having been totally excised; (2) the technique used gave greater assurance of total excision and may give greater safety if used in cases of certain melanomas; (3) the condition of leiomyoma is rather uncommon; (4) patients with isolated leiomyomas of the iris may be spared enucleation.

Malignant melanoma is the most important and most frequent neoplasm of the iris and caution must be urged in every case to use judgment in regard to attempted excision, making sure that the iris angle and root are free from involvement so that the lesion can be completely removed.

It is also urged that trauma to the neoplasm be avoided and that sufficient exposure of the area be provided so that the lesion may be completely and cleanly removed. It is advised that the tumor be not dragged through a small incision, thus avoiding the rubbing off of seedling malignant cells which might cause local or systemic spread of the tumor.

THE LITERATURE

It is well to quote first directly from the Moultons[2]:

"In 1923, Verhoeff reported a case, and at the same time reviewed the literature and established certain criteria as necessary for the diagnosis of this tumor. According to these criteria, he accepted only two previously reported cases as being authentic, Thompson's case in 1899, and Van Duysen's case in 1911. Frost, in 1938, and Ellett, in 1939, each reported a case. In 1943, Kahler, Wallace, Irvine, and Irvine described a case and, in 1944, Davis, Sheppard, and Romejko reported one. In addition two cases which were not the subject of separate reports have been mentioned in the literature. These include a separate case of Verhoeff's, mentioned by Li in 1923, as a "prob-

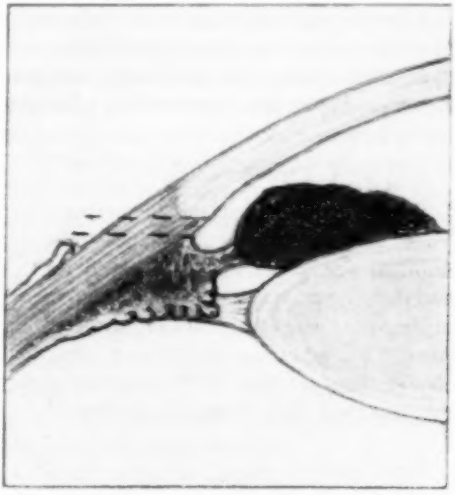

Fig. 1 (Kirby). Schematic drawing of relation of neoplasm to structures of anterior chamber. The anterior dotted line represents the usual knife or keratome section plane. The posterior dotted line represents the plane which may be followed in the initial ab externo incision.

Fig. 2 (Kirby). The conjunctiva may be incised with scissors two to three mm. from the corneal margin or it may be freed with a knife directly at the margin.

able epiblastic leiomyoma," and a case Zentmayer reported as a primary leukosarcoma of the iris, but mentioned in Davis's paper as having been proven on re-examination to be a leiomyoma."

The Moultons[2] reported their case in which the clinical diagnosis of leukosarcoma had been made and enucleation performed. Manifestly from the clinical description and illustrations, total excisional biopsy was not feasible. Pathologic examination showed leiomyoma.

The Pathology

Verhoeff[6] said "that the tumor must be made up of long spindle-shaped cells of uniform size, containing rod-shaped nuclei, and showing a tendency for the cells to occur in bundles with their nuclei arranged in rows. In addition, differential staining should show myoglia fibrils coursing along the cells and their terminal processes."

Reese[7] wrote:

"Smooth muscle from which a myoma may arise is encountered in ophthalmologic practice in the ciliary body, the iris, the orbit, and the media of blood vessels. In the ciliary body, orbit, and media of blood vessels, the smooth muscle is mesodermal and in the iris it occurs in the form of the dilator and sphincter muscles, both of which are neuroectodermal. Smooth muscle tumors may, however, arise at sites where smooth muscle is not normally found.

"In Verhoeff's case of leiomyoma of the iris, the tumor arose from the anterior surface of the iris near its root; it had no connection whatsoever with the dilator or sphincter muscle or with the pigment epithelium. Verhoeff concluded that it originated from the stromal cells of the embryonic uvea, possibly from misplaced cells which ordinarily would have taken part in the formation of the ciliary muscle. Therefore, leiomyomas may be neuro-ectodermal or mesodermal, and in the latter instance they may arise from embryonic nests of mesodermal cells which are predestined to form smooth muscle. Although there are these three possible sources of leiomyoma in the eye, I know of no histologic differences in the lesions as a result of their site of origin."

Reese continued:

"There is no doubt that leiomyomas occur in the ciliary body and iris, but most of the cases reported in the literature have been so

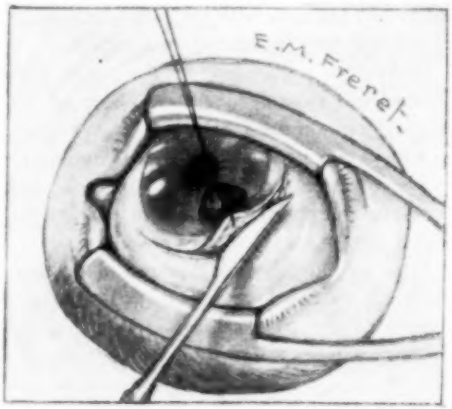

Fig. 3 (Kirby). A traction suture is used to elevate the flap as the knife incision is started on the posterior plane. The knife is used to slice, not to scratch, ab externo.

inadequately documented that their acceptance as instances of myoma has been equivocal. The pathologic characteristics which must be present to justify a diagnosis of leiomyoma include:

"1. A structure of interlacing, closely packed bundles of elongated, spindle-shaped cells.

"2. Long, oval nuclei tending to arrange themselves in a palisade formation.

"3. Granular eosinophilic cytoplasm of the cells.

"4. Myoglia fibrils.

"The most important of all the above criteria is the demonstration of the presence of myoglia fibrils, and it is this feature which is lacking in most of the reported tumors. The myoglia fibrils can be demonstrated with the Mallory phosphotungstic hematoxylin stain, the Masson trichome stain, or the gold impregnation stain. These special stains demonstrate the myoglia fibrils as longitudinal striations tending to coalesce or to fuse and thus to form larger and coarser fibrils at the cell terminal.

"Verhoeff pointed out another difference between a leiomyoma and other spindle cell tumors, such as sarcoma. He states that the myoma cells are truly spindle-shaped whereas the cells of the uveal spindle-cell melanoma are seldom, if ever, distinctly spindle-shaped but terminate in, or send off laterally, several ill-defined irregular processes which anastomose with neighboring cells and in this fashion form a more definite syncytium.

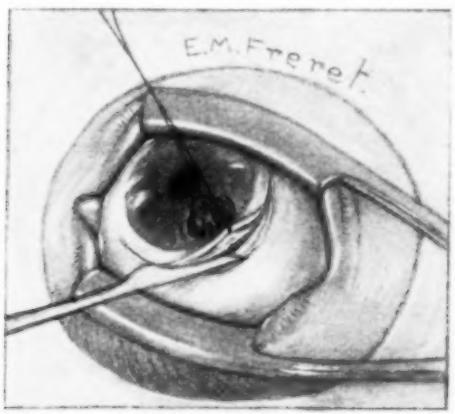

Fig. 4 (Kirby). The knife incision is deepened in the posterior limbus plane to about three fourths of the thickness of the tissue.

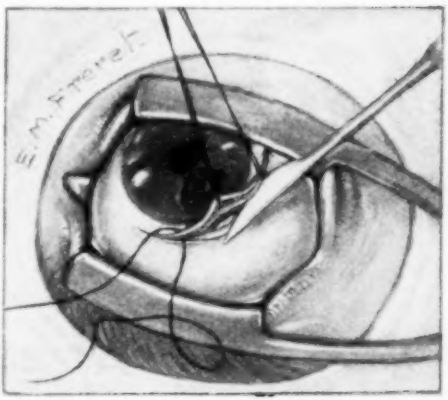

Fig. 5 (Kirby). After penetration in the central area, traction on the sutures is helpful in following the posterior plane into the angle of the anterior chamber.

"When a leiomyoma is or becomes malignant, particularly after repeated attempts at excision, it is less differentiated than in the benign state. Lesions of this kind are probably confused frequently with round-cell sarcomas. A given tumor may not meet the criteria for a leiomyoma, but it may nevertheless be a poorly differentiated leiomyoma or leiomyosarcoma. In Terry's case of leiomyoma of the orbit, which presumably had its origin in Mueller's muscle, the first specimen showed a picture typical of this tumor. The tumor recurred several times, and at each recurrence it less clearly resembled a myoma. It finally lost its semblance to a leiomyoma and presented the appearance of a sarcoma. Verhoeff, in his discussion of Frost's case questioned whether some of the spindle-cell melanomas of the choroid may not in actuality be anaplastic leiomyosarcomas."

Leiomyoma of the Iris

Reese is authoritative:

"These tumors may be well localized and

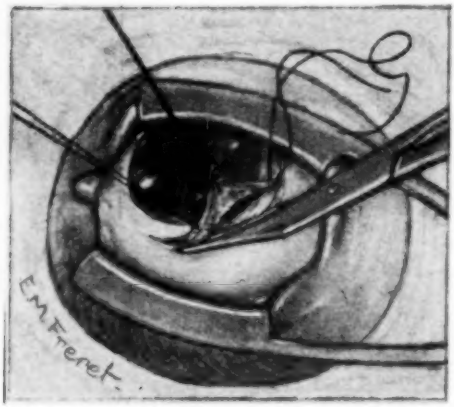

Fig. 6 (Kirby). After the area of the neoplasm has been cleared by the ab externo knife slicing, the incision may be completed with scissors.

even somewhat pedunculated, but more often the growth is rather diffuse and flat with a predilection for the pupillary half of the iris. The tumor may be entirely localized, but not infrequently it infiltrates the stroma of the iris and shows a tendency to spread along the surface of the iris and even into the angle. It is a cohesive tumor with no evidence of disseminated tumor cells and implantation growths.

"In my experience the presence of some ectropion uveae over the tumor area is a common thing. Frost mentioned this and posed the question of whether these modified smooth muscle fibers might not retain some contractility, presumably without a nerve supply and thus cause the ectropion. The tumor usually is lightly pigmented. Ellett's case was characterized by repeated hemorrhages into the anterior chamber.

"The tumor is usually benign as evidenced by the morphologic characteristics of the cells, the absence of mitoses, and in some of the reported cases the history of long duration with slow growth.

"If it were possible to be reasonably certain of the diagnosis of leiomyoma of the iris, excision would be indicated when the tumor was sufficiently localized. Since the tumors are apt to grow slowly it might be advisable in some instances merely to observe the lesion and resort to surgery only if the rate of growth should indicate it.

"When there is active growth associated with diffuse involvement of the iris and/or the angle, enucleation should be undertaken.

"The tumor is entirely radioresistant, and, therefore, irradiation of any kind is of no avail."

While no reports on the use of aspirated aqueous have been made in the search for significant cells for diagnosis, this method might be used. It is true that a positive finding would indicate the diagnosis but negative findings would not exclude the all important malignant melanoma which usually defy all efforts at total excision and when found or confirmed by biopsy would indicate enucleation without delay.

Iliff[8] classified tumors of the iris as (1) benign—the nevi, melanomas, freckles of the iris, and iris cysts; (2) malignant—the melanomas, the melanosarcomas, the epithelial tumors, and the leiomyoma. All may contain pigment that makes clinical differentiation impossible.

The benign melanoma may be flat or slightly raised. It may change in density of

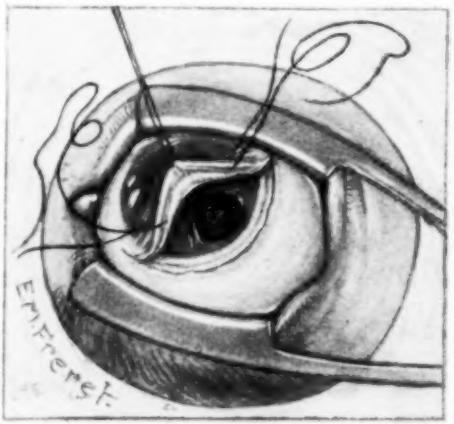

Fig. 7 (Kirby). The elevation of the corneal flap by the traction suture, exposing the neoplasm to full view.

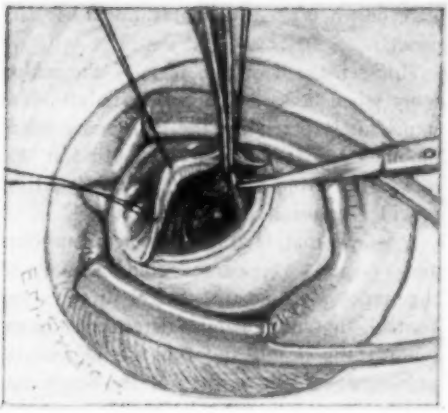

Fig. 8 (Kirby). The total excisional biopsy is started in the normal iris tissue, two mm. from the neoplasm.

pigmentation and this may make it suspicious of becoming malignant.

Malignant melanomas of the iris are rare in comparison to those of the choroid. They are nodular, darkly pigmented and have dilated vessels coursing through and around them.

Epithelial tumors arising from the posterior iris epithelium are rare.

Leiomyomas appear as yellowish gray or pinkish nodules, giving few symptoms, grow slowly, and rarely invade the angle. They are of ectodermal origin arising from the sphincter muscle. The tumor is noninvasive.

Friedenwald, et al.[5] state that tumors of the dilator and sphincter muscles are cytogenically retinal but topographically iridic. They also say that, unfortunately, eyes that were normal except for leiomyomas have been enucleated when iridectomy would have sufficed, but that there is another iris tumor apparently derived from the iris muscles, although its orgin has not been definitely determined, that is much more invasive and malignant in appearance. The latter contains many large bizarre cells, some with hyperchromatic and vacuolated nuclei. Tumor giant cells may also be present.

It is probably the lack of sufficient data in regard to the rare leiomyoma and the rarer tumor described by Friedenwald which has led to the confusion of opinions expressed by some as to the malignant or benign nature of the leiomyoma.

Indications for total excisional biopsies of iris tumors

If the lesion is slowly growing, having been present according to the patient's knowledge or according to the surgeon's observations, for quite some time, even for years; if examination shows the mass to be isolated, particularly not involving the angle and the ciliary body as determined by various observations including gonioscopy; if the pupil is not too distorted, thus indicating that the total mass is not sufficient to displace the iris tissue and to push out from the relatively solid tissue of the ciliary body and sclera; if the mass under suspicion is single, there being no other small or so-called "sister nodules"; if transillumination verifies the location and extent, particularly indicating that the ciliary body is not involved; if, as the Moultons have pointed out, the lesion is located in the inferotemporal area of the iris; and, finally, if the mass is salmon or flesh colored even with a gray overcast, then total excisional biopsy is indicated as the neoplasm may well be a leiomyoma.

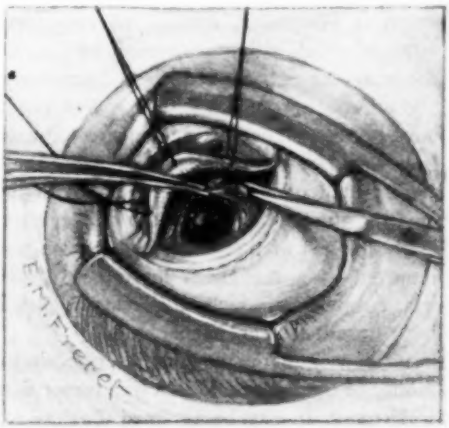

Fig. 9 (Kirby). A radial cut is made through the sphincter of the iris.

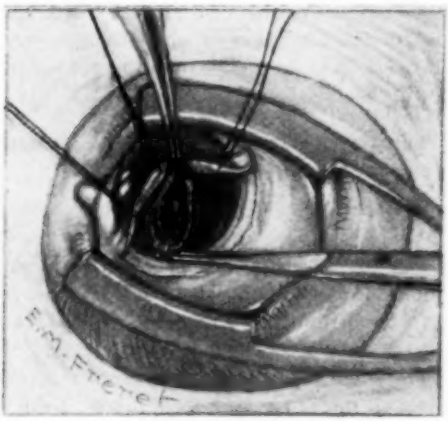

Fig. 10 (Kirby). The peripheral iris tissue is freed with scissors or it may be torn from the base. Only one grasp of the iris is made.

Sanders[1] said that in general it can be concluded that iris lesions are ideal for excisional biopsy because: (1) they can be accurately examined not only with the slit-lamp, so that their nature can be evaluated, but also with the gonioscope, and involvement of the iris base and ciliary body can be ruled out; (2) they can be easily and completely removed without damage to the surrounding tissues; (2) the site of removal can be observed for evidence of recurrence.

Sanders[1] said: "The value of excisional biopsy in the proper management of an iris lesion is evident. A number of eyes were retained which without this procedure would probably have been removed. Conversely, several enucleated eyes with excellent vision have been examined by me which could have been saved by a simple biopsy. Among these are a small malignant melanoma involving only the pupillary border of the iris, an intraepithelial cyst of the ciliary body which was removed as a malignant melanoma of the iris, removal of which had been suggested, but refused, 25 years earlier."

It is well to define and describe simple biopsy of the iris or excision of a tumor with iridectomy. It may be assumed that the excision with iridectomy is to be done as simply as it is when preliminary to cataract extraction, or when used in the treatment of glaucoma.

Iliff[8] enlarged on the idea of the iridectomy when he said that a cyclodialysis done immediately preceding the iridectomy would mobilize the iris somewhat so that it was more free from the angle, thus permitting a wider excision of the tumor.

I believe that, if at all possible, a sufficient and adequate exposure should be made of the tumor area, so that, under direct visual control, the surgeon may determine the extent of the lesion and the freedom or involvement of the tissues at the angle and decide whether or not it is feasible to remove the tumor in toto, leaving behind only normal iris tissue. The incisions can be so directed that neither the tumor nor iris tissue is unnecessarily traumatized. A relatively bulky specimen should not be forced through the small and rather tight opening of a keratome incision. In my opinion, a limbus incision should be made and it should be large enough so that one can see to work properly. This provides the best chance of leaving no tumor tissue behind.

In any biopsy of iris neoplasms, an effort should be made to do a total excisional biopsy since it is possible that incisions or other trauma to malignant neoplasms may hasten

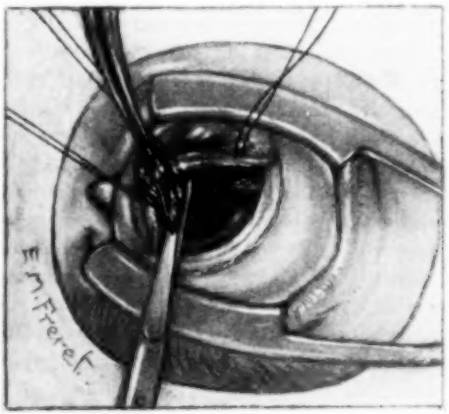

Fig. 11 (Kirby). The final excision is made by a radial cut through the iris at least two mm. from the neoplasm.

or actually cause metastases. For this reason, it is evident that biopsies of iris lesions invading the iris angle and becoming confluent with the ciliary body should not be made unless there is reasonable doubt that they are not malignant melanomas.

Sanders[1] wrote that, prior to his survey, he had been unable to find a systematic evaluation of excisional biopsy of iris tumors in the literature. His series of 24 specimens of iris tumors included 11 malignant melanomas, three inflammatory pseudotumors, one leiomyoma, eight epithelial implantation cysts, and one intra-epithelial cyst. He also examined 16 cases in which a specimen of iris had been removed in cases of cataract and glaucoma.

Technique of Incision

In order to obtain adequate exposure and to avoid trauma to the iris neoplasm during the procedure, I would use first an *ab externo* incision. The conjunctiva may be cut with scissors two to three mm. from the limbus, or the peritomy may be done cleanly by inserting the knife directly at the limbus where the loose conjunctival epithelium goes over into the adherent corneal epithelium. With the latter method, the limbus incision can be made entirely extra-epithelial.

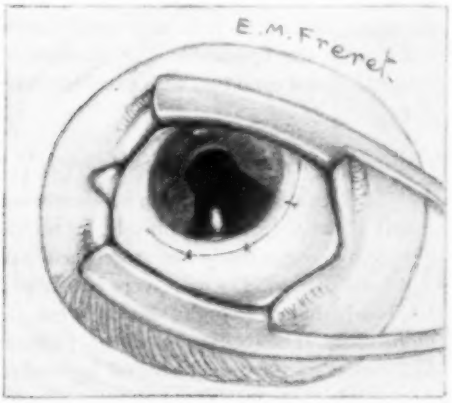

Fig. 12 (Kirby). The appearance of the eye directly after the excision. Radial appositional post-placed corneoscleral sutures are used to close the incision.

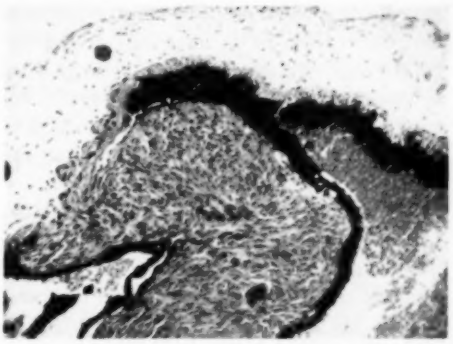

Fig. 13 (Kirby). Photomicrograph, showing leiomyoma spindle cells arising from the region of the dilator muscle.

The limbus area should be exposed over an adequate area which is not just equal to the area of the tumor. It should permit of a limbus incision large enough so that, with suture traction, the corneal flap can be elevated to afford adequate exposure of the iris.

The limbus incision is started by ab externo slicings with a round bellied scalpel. This instrument I prefer, since I can always have a sharp knife by using replaceable blades. Fixation with forceps or with a pic may be advisable so that the line of the limbus slice can be followed most accurately. The entire area of the proposed incision is sliced half way or more through, then sutures are placed in the corneal lip of the incision. Using traction on the various sutures as need be and with toothed-forceps fixation of the scleral edge, the incision is carried through into the angle of the anterior chamber.

After the initial entrance, the knife is used to cut against the fixation provided by the suture and forceps, enlarging the incision on both sides. Then, if necessary and particularly when it is seen that the area of the tumor has been passed, scissors may be used to complete the incision. It may seem to be unnecessary to make an incision wider than the tumor is large, but experience has shown that it is necessary if the surgeon wishes to elevate the corneal flap.

My experience with large incisions and

their healing when properly sutured indicates that an incision of at least half of the circumference of the cornea may be used when necessary for exposure of an iris tumor for total excisional biopsy. When this had been done and the iris exposed, the excision can be easily carried out.

The normal iris tissue is grasped with iris forceps two mm. from the tumor, buttonholed, incised through the sphincter, and then through the base; this is followed by drawing the iris and tumor centrally while the incision is being carried along the base. It would seem that, if one mm. of the periphery of the iris is free from invasion, the procedure is feasible.

After the tumor area has been passed, the line of incision is turned radially toward the pupil and the total excisional biopsy is completed. The iris forceps and the scissors used in the excision are set aside after the specimen has been put directly into fixation. After inspection of the area to make sure there is no incarceration of the pillars of the iris, suturing of the limbus incision is completed. If the peritomy has been done directly at the limbus, the conjunctival flap is sutured over the limbus incision after it has been closed by the corneoscleral sutures. Healing should be uneventful.

Leiomyoma of the Iris Cured by Total Excisional Biopsy

Case Report

A. V. F., a white woman, was first seen in June, 1946. The entire eye examination was negative, except for the presence of a vascularized slightly thickened mass in the inferotemporal quadrant of the left iris. Dr. David Webster who had seen this patient five years previously had no record of any such lesion. The vision was 20/20 (6/6) in each eye.

The tumor mass was quite close to the pupillary area centrally but extended peripherally in the iris. Gonioscopy and direct examination indicated that at least two mm. of peripheral iris tissue was free from invasion. A large vessel was seen in the angle and running toward the tumor, but there was no tumor elevation in the angle. The greatest height of the tumor above the surrounding normal iris tissue was 1.5 mm.

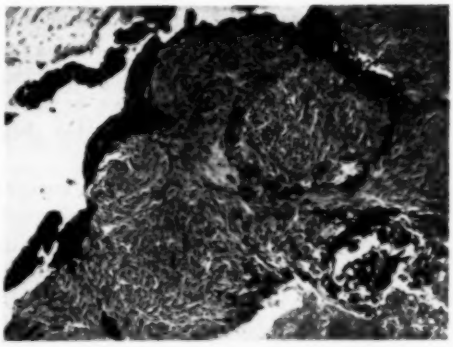

Fig. 14 (Kirby). Leiomyoma. Palisade of oval nuclei in spindle cells. Myoglia fibrils were demonstrated by special stain.

The pupillary border was flattened somewhat. There was no ectropion of the retinal pigment layer of the iris. Dilatation of the pupil demonstrated the volume and distortion effect of the mass of the tumor. Transillumination gave no further data.

Consultation with two ophthalmologists resulted in a probable diagnosis of malignant neoplasm but that total excisional biopsy rather than enucleation seemed to be indicated. This was performed according to the technique described. It is now nearly seven years since the operation. The eye has remained in good condition with excellent function.

Microscopic examination as follows:

"The area of neoplastic spindle cells was found to be surrounded entirely by normal iris tissue. Apparently the total neoplasm had been excised. The cells were irregular in size and shape. Myoglia fibrils were demonstrable. The cells, devoid of pigment, had rather large spindle-shaped hyperchromic nuclei, many arranged in palisades. There was considerably increased vascularity in the tumor tissue. The opinion was expressed by Dr. A. A. Eggston that the cells were radiation resistant.

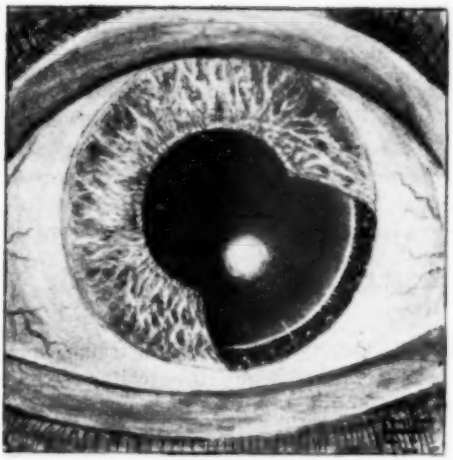

Fig. 15 (Kirby). Appearance of the eye six years after operation. The iris had been excised at its very root.

"*The pathologic diagnosis* of leiomyoma of the iris arising from the dilator muscle fibers and of ectodermal origin was made by Dr. Joseph Laval. The extent of the tumor made it impossible to say whether the origin had been from the sphincter or dilator muscle fibers. The diagnosis of leiomyoma was concurred in by Dr. F. Verhoeff and Dr. A. B. Reese."

There has been no local recurrence of the tumor and no evidence of metastases. The patient, seen recently, has 20/20 vision with correction. There is a wide coloboma in the area of the excision. The usual details of the lens border, zonule, and tips of the ciliary processes are evident.

Summary and Conclusions

The literature on leiomyomas of the iris has been reviewed. About 12 cases have been reported. A new case is added. The interesting feature of this case is that the neoplasm was totally removed by excisional biopsy with iridectomy. It is believed that other neoplasms, even melanomas when isolated or surrounded by normal iris tissue, may be totally excised, thus sparing the patient enucleation. Differentiation of benign leiomyomas from malignant neoplasms cannot always be made by clinical examination.

If the angle of the anterior chamber is free, total excisional biopsy is indicated. A technique by which this may be effected is described. Starting with *ab externo* incisions, the limbus is cut until the corneal flap can be elevated by traction sutures to afford clear visualization of the details of the angle and of the iris and to give adequate working space in which the excision of the tumor can be made. This method may provide greater safety in the removal of iris neoplasms.

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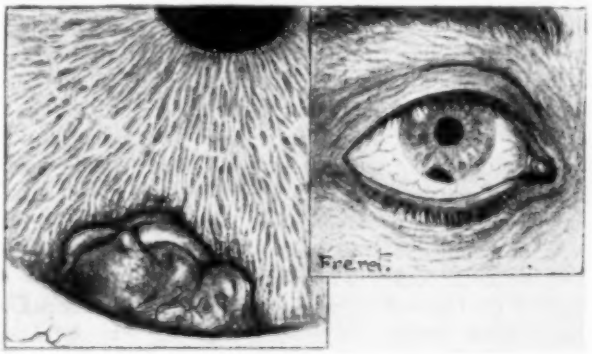

Fig. 16 (Kirby). Another case with the clinical diagnosis of leiomyoma observed by me for over 12 years, with very little change in the size of the neoplasm.

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READING DIFFICULTY (PARALEXIA) FROM IMPAIRMENT OF VISUO-OCULOGYRIC ADJUSTMENT

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Lesions affecting visuomotor adjustments of the eye may involve the occipito-mesencephalic tract which conveys impulses from the visual centers of the occipital lobe to the nuclei in the brain stem serving eye movements. These affections produce an interesting and diagnostic symptom which may be called paralexia or difficulty in reading. This type of reading impediment requires further analysis.

The occipito-mesencephalic tract (right and left) arises in the para- and peristriate, and possibly the striate, areas of the occipital lobe and courses forward in the internal sagittal stratum paralleling and adjacent to the inner fibers of the optic radiations. The tract then by-passes the thalamus and, continuing in the brachium of the superior colliculus, terminates in the tectum of the midbrain and possibly lower levels. Both crossed and uncrossed fibers connect this tract with nuclei of the oculogyric nerves.

The occipito-mesencephalic tract conducts responses to visual sensations to the nuclei serving the extrinsic and intrinsic muscles of the eye. The chief action is centering and following. Further function is concerned with focusing or accommodation and vergence or disjunctive adjustments.

If the lesion occurs in the occipito-mesencephalic tract of the right side, the patient complains of difficulty in reading. It is necessary for him to reduce his visual reading speed and he must repeatedly "go back to pick up" the first letters or syllables of the long words. The patients all seem to have exactly the same annoyance in reading and describe their difficulty in virtually the same words.

If the lesion is on the left side, the complaint is the necessity for slower reading and the inability to see the right hand letters or syllables unless the head is constantly turned toward the right. In patients who are right-handed, a large lesion involving the visual recognition and revisualization areas may result in a sensory aphasia, or visual agnosia. Then reading difficulties are overshadowed by this more disturbing condition.

Early in the investigation it was thought that the reading impediment was produced by the homonymous hemianopia in which the left- (or right) hand letters of a word were missing in the field defect. The first patients, studied with this symptom in mind, had homonymous field loss. They had sparing of the macula and good and equal vision in each eye.

Later, however, two patients were seen with the same complaint, without visual field loss. In one, the symptoms were transient—the condition was probably a cerebral vasospasm. The other patient with apparently normal fields had reading difficulty for left-hand letters and had visual hallucinations. The reading difficulty persisted but the hallucinations disappeared and were replaced by left homonymous hemianopia. It was thought that this patient had a thrombosis of the right posterior cerebral artery.

In every case, there was an absence of optokinetic nystagmus with the rotating drum

turning toward the side of the lesion. A normal response was found when the drum was rotated toward the opposite side. Induced vestibular nystagmus was present and gave normal response in all cases.

Electro-encephalograms usually registered abnormal graphs in the involved occipital area in the patients with visual field loss which probably indicated a more extensive lesion. In the patients without field defects the electro-encephalograms were normal, probably indicating smaller lesions.

Ocular myograms taken for the purpose of determining the type of nystagmus on the unaffected side showed the usual quick and slow phases with regular wave, the normal for optokinetic nystagmus. This induced nystagmus did not influence the electro-encephalographic pattern of response from either the occipital or frontal areas in the normal or affected cases.

The lesions producing the symptoms of paralexia were, in this small series, usually found to be vascular, the result of thrombosis or hemorrhage. Several head injuries, and one tumor, a glioblastoma multiforme, produced these symptoms. In the few cases seen at operation or autopsy, the lesions included the occipito-mesencephalic tract but an isolated and circumscribed lesion occupying only this tract has not been observed.

I should like to report, herewith, by summary the pertinent history of five relevant cases.

Case reports

Case 1

P. V., a man, aged 53 years, complained of headaches and inability to read because it was "necessary to hesitate and sometimes read back so as not to skip small words or the first letters or syllables of long words."

Vision was 20/20 in both eyes for distance. Glasses were only worn for close use. Eye movements, including version, vergence, and duction, were normal. Visual field studies revealed homonymous left altitudinal reduction of the peripheral fields which during the course of several months increased to hemianopic proportions and advanced to within 15 degrees of center. Optokinetic nystagmus tests revealed absence of response upon turning the rotating drum to the patient's right; normal response to the left.

The complaint of impediment in reading persisted. Finally, the patient stated that in addition to reading difficulties he was unable to understand what he was reading.

Ventriculographic studies disclosed compression of the right lateral ventricle and left lateral displacement of the left lateral ventricle. A glioblastoma multiforme was found in the right occipital lobe extending into the parietal and temporal lobes.

From the symptoms, involvement of the occipito-mesencephalic tract probably accounted for difficulty in reading. Later, with the inability to understand reading, the psychic areas of 18, 19, possibly 39 (of Brodmann) were evidently implicated.

Case 2

G. S., a man, aged 48 years, was referred because, according to the neurologist's report, "in reading, a blind field appears toward the right of his midline." The report continued: "Distance vision is normal and, to rough tests, physical field disturbance seems to be fairly well compensated for, though probably present. The cranial nerves elsewhere present no abnormalities. It is my impression that he is suffering from the residual effects of a very small cerebral thrombosis which implicated a portion of the left optic tract."

Examination of this patient revealed vision for distance of 20/20, R.E., and 20/25, L.E. Glasses were used for close. Visual field studies revealed a slight homonymous lower quadrant indentation in the right side of about 30 degrees. Extraocular muscle balance was normal. Later tests showed that, when the head was turned to the left, necessitating turning the eyes to the right, diplopia of four to eight degrees appeared. There

was no separation of images when the opposite position was taken.

The patient stated that he "had to spell every syllable out going to the right; going to the left was not so bad." He also stated that he almost always returned to the same line or skipped a line in reading and had to mark the line with his finger or piece of paper.

Optokinetic nystagmus tests showed absence of response on turning the rotating drum to the left; normal response to the right. Evidently the left occipito-mesencephalic tract was involved.

CASE 3

M. L., a woman, aged 72 years, complained that she "can't see letters, syllables, or words when reading unless my head is turned toward the right constantly." She further stated that she could not see well to the right.

Corrected vision in each eye was 20/20 for distance and normal for close. Visual fields showed no peripheral or central defects. Exophoria of one degree was present for distance and of three degrees for close. Eye movements were normal.

Optokinetic response was absent on turning the rotating drum to the patient's left; normal toward the right.

The patient stated that she had intermittent "high blood pressure" and that she had had an attack of dizziness with inability to think and speak clearly for a few days before she noticed difficulty in reading. All but the reading disturbance had cleared. Her doctor thought she had a cerebral vascular spasm.

Three months after the examination outlined here the inability to read had disappeared, optokinetic tests were normal. The vasospasm had evidently involved the occipito-mesencephalic tract.

CASE 4

O. G., a man, aged 76 years, complained of missing the left-hand letters of words in reading. He also said he saw "phantoms, always to the left side, which were dark and colorless of men, figures, or parts of figures." It might be well to say that this patient is left-handed.

Corrected vision in the right eye was 20/30; in the left, 20/25. Peripheral visual fields were full. Central fields showed no defect. An esophoria of five degrees was present for distance; no imbalance for close. Version, vergence, and duction tests were normal. Optokinetic nystagmus was absent on rotating the drum to the right; it was normal to the left.

Reading difficulty continued and gradually a left homonymous hemianopia developed with sparing of central vision. A thrombosis of vessels supplying the right visual area and involving the occipito-mesencephalic tract is suspected.

CASE 5

O. F., a man, aged 59 years, suffered cerebral hemorrhage resulting in left hemiplegia eight months prior to the time of the present incident when his nurse phoned telling me that, since his awakening that morning, he was having great difficulty in reading and, as that was his only solace, would I please see him immediately. By this time I had seen enough patients with this complaint to include the rotating drum with the portable perimeter when I called at the patient's home.

The symptoms complained of were inability to see the first letters or syllables of a word when reading, which compelled slower reading and repeated back viewing for missing letters in order to understand.

The left eye had been destroyed by an accident, an acid burn, 30 years before. Vision of the right eye was 20/30, uncorrected. A reading lens was worn. Visual fields showed left hemianopia with sparing of central vision. Muscle action appeared normal. Optokinetic response was absent upon turning the rotating drum to the right; normal to the left.

Evidently a recent vascular accident had occurred on the same side as the previous one, this time affecting the visual system and implicating the occipito-mesencephalic tract.

SUMMARY

Disturbed reading with failure to see the right- or left-hand letters or syllables of a word is produced by a lesion in the visuo-oculogyric system.

Absence of optokinetic nystagmus upon rotating the drum toward the side of the lesion is a constant finding.

Homonymous visual field loss is frequently but not necessarily present in patients complaining of this reading difficulty. From this it is assumed that the blind area of the field is not responsible for the disturbed reading or for the absence of optokinetic nystagmus.

Patients with homonymous hemianopia, with sparing of the macula and good vision in each eye, who have normal optokinetic nystagmus do not experience this type of reading difficulty.

Apparently the voluntary frontal oculogyric and the reflex proprioceptive positioning systems come to the support of the damaged involuntary visuomotor system in attempted adjustment.

Although reading is primarily a voluntary act the involuntary visuomotor system aids in continuous and smooth reading and influences rapidity of reading.

The lesion causing this type of paralexia is probably in the occipito-mesencephalic tract.

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PRESENT CONCEPTS OF SURGERY OF THE SUPERIOR OBLIQUE MUSCLE

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During the past two decades the thinking of ophthalmic surgeons on the surgical correction of either a spastic or paretic superior oblique has undergone a radical change. Well before the turn of the century von Graefe[10] had established the dictum that it was a dangerous procedure to operate upon the superior oblique, and for years outstanding ophthalmologists, whose courage and judgment in other phases of our specialty could not be questioned, clung to this theory with all the tenacity and determination of the drowning man clutching at the proverbial straw.

While there are several reports of isolated attempts at surgery on the muscle prior to 1934, it was not until Wheeler[14] in that year published his method for advancement of the tendon of the superior oblique in cases of underaction of the muscle that our attention was forcibly drawn to the feasibility of the direct surgical attack upon the offending muscle in such cases.

In spite of this pioneer work and the subsequent work of other authors the well-established belief of the majority of ophthalmologists as to the inviolability of the superior oblique was difficult to shake, as witness the statement of Gifford,[9] in 1941, that it is "inadvisable to disturb the superior oblique." Indeed, it is only since the termination of World War II that we have begun to see a slowly but surely increasing acceptance of the advantages of surgery upon this muscle.

To what is this apparent lethargy of ophthalmic surgeons due? It is my belief that several factors are involved.

In the first place, as has been previously noted, there is the deeply ingrained fear of tampering with the superior oblique and, having been imbued with such a belief over a period involving most of one's professional life, it is perhaps difficult to readjust one's views in a relatively short period of time.

Secondly, the anatomy and physiology of this muscle are generally not too well un-

derstood and it may well be that this causes some hesitancy in operating. However, if the work of Fink and Adler on these phases of the subject is thoroughly comprehended there should be no cause for hesitancy in regard to the anatomy and physiology.

Then there is the confusion engendered by two opposing schools of thought as to the relative frequency of involvement of the superior oblique in vertical motor palsies.

One group, including Duane,[6] White and Brown,[15] Anderson,[2] and others holds that the superior rectus is the muscle at fault in by far the greater majority of vertical muscle imbalances.

The second group, which includes Adler,[1] Bielschowsky,[4] Davis,[5] and others believe that in isolated vertical motor paralyses the superior oblique is at fault far more frequently than any other muscle.

The apparent reason for this discrepancy lies in the fact that the first group compiled their statistics on this subject while including the vertical deviations with all the other lateral imbalances, while the latter group considered only isolated vertical motor paralyses.

I feel that, in cases of lateral imbalance with an associated vertical imbalance, it is undoubtedly true that the superior rectus is the vertical muscle most frequently at fault. However, it is difficult to understand why, in cases of isolated vertical imbalance, assuming the superior rectus is most frequently at fault, we do not see more cases of ptosis associated with such a deviation. Why should that portion of the third nerve which supplies the superior rectus be singled out for paralysis so frequently?

At the risk of appearing dogmatic it would seem that the answer is fairly obvious, the superior oblique, and not the superior rectus, is the muscle most frequently at fault in isolated vertical motor imbalances.

Paralysis of the inferior rectus

There are two situations in which operations upon the superior oblique may be logically considered. In the most common of these two, in which there is a paresis or paralysis of the muscle, an attempt is made to strengthen the muscle, while in the second situation, there is a weakness of the opposite inferior rectus with a corresponding overaction of the superior oblique and, in these instances, an attempt may be made to weaken the overacting superior oblique if conditions are favorable. Since the latter situation is far less prevalent than the former, it is with that phase of the subject that I shall deal at the outset.

In the surgical correction of paralysis of the inferior rectus, we are faced with strengthening the affected muscle or weakening the yoke muscle, the superior oblique of the opposite eye. When there is a true paralysis of the inferior rectus and fixation is with the sound eye, a resection or advancement of the muscle may be done. However, such an operation may be followed by a slight overcorrection in upward gaze and, as Dunnington[7] warns, it is wise to proceed with the strengthening procedure cautiously unless the deviation is pronounced above as well as below the horizontal plane.

Weakening of the opposite superior oblique should be done when the paretic eye fixes and when paralysis of the inferior rectus is not marked. It should be realized, however, that in such a case the vertical deviation will be greater than when the sound eye fixes, since in this instance we are dealing with a secondary deviation.

There have been two methods described for weakening the superior oblique, the first being that of Hughes and Bogart[11] which dislocates the pulley and allows it to recede into the orbit. The essential technique of this operation consists of making a small skin incision over the trochlea and displacing it backward with a periosteal elevator. This has much the same effect as some of the radical operations for frontal sinusitis, such as the anachronous Killian procedure.

More recently, Berke[3] has described his intracapsular operation for tenotomy or

tenectomy of the reflected portion of the tendon of the superior oblique. In my opinion this is the operation of choice in such a condition. The operation in itself is simple in its execution and the results have been good. A tenotomy is done if only a small amount of weakening is desired and a tenectomy is performed if a larger correction is needed. Overcorrection with this operation has been rare since the capsule of the tendon is not destroyed and thereby permits ready healing.

In a personal communication, Berens states that he has recessed the tendon of the superior oblique in several cases. I have had no experience with this operation and, therefore, do not feel qualified to discuss it.

Paralysis of the superior oblique

As has been stated, this is the most common paralysis of an individually acting vertical muscle and it produces by far the most distressing symptoms of any ocular motor weakness. The reasons for this are several.

In the first place, the field of action of the muscle is in the downward direction of gaze and it is in this direction that we most frequently use our eyes, for by far the greater part of all close work is at a level below the eyes.

Secondly, Adler[1] has estimated that 56 percent of the power of the muscle is used for intorsion; consequently, any weakness of the muscle will cause a marked tilting of objects in addition to the vertical separation.

Until the late John M. Wheeler,[14] in 1934, published his procedure for the advancement of the tendon of the superior oblique in cases of paresis of the muscle, operations upon this muscle were considered unsound. The muscle was thought to be too difficult of access to permit easy operation; consequently, in pareses of the superior oblique various other procedures had been carried out, such as recession of the opposite inferior rectus, weakening of the ipsilateral inferior oblique, recession of the superior rectus of the same eye, and even resection and advancement of the inferior rectus of the same eye.

Wheeler's operation was the introduction to surgery of the muscle and was certainly a step in the right direction. However, the operation itself left something to be desired for two reasons.

In 1946,[12] I published my modification of Wheeler's procedure and since that time there have been several other operations described by McLean[13] and others.

In resection of the tendon of the superior oblique as I now practice it, the tendon of the superior rectus is severed and a fixation suture passed through the stump of the muscle. This suture serves to give excellent depression of the globe and to bring the tendon of the superior oblique into the operative field. I feel that it is best to get a complete exposure of the tendon of the oblique, for in many cases the tendon is extremely tenuous in its distal portion from the lateral border of the superior rectus to the insertion.

When the tendon has been exposed, a small muscle forceps is placed on it at varying intervals, with the eye turned down and in, and the forceps is then carried back and outward to the insertion. When a point has been reached where the tendon is fairly taut, with the forceps at the insertion, the necessary amount of tendon to be resected will have been determined.

The tendon is then sectioned immediately distal to the forceps and a double-armed chromic catgut suture is passed through the proximal portion of the tendon adjacent to the forceps. The two arms of the suture are then passed through the most distal portion of the severed tendon at the insertion into the sclera and tied. The distal portion of the tendon is then excised.

Tenon's capsule may then be placed over the tendon of the oblique and sutured in position, thus completely covering the operative field and insuring against adhesions between the oblique and the superior rectus.

I have had excellent results from this

procedure and have noted no untoward effect from the tenotomy of the superior rectus. In the operation for tucking the tendon of the superior oblique, as described by McLean, the superior rectus is not cut but simply retracted to one side.

In paresis of the superior oblique when the sound eye fixes (primary deviation), I feel the operation of choice is a strengthening procedure upon the paretic muscle. This may be performed by the advancement of the tendon according to the technique of Wheeler, by McLean's tucking operation, or by the resection of the tendon of the superior oblique as described by me.

In secondary deviation, when the paretic eye fixes, there will be a greater vertical separation and I firmly believe that the primary procedure in this instance should again be resection of the tendon of the superior oblique. If the deviation is very marked, it may be necessary to do a recession of the opposite inferior rectus and, while some surgeons prefer to do this at the same time that the resection of the superior oblique is done, I feel that it is preferable to resect the paretic superior oblique first and get as much correction as possible by this method. Then later, if the desired result has not been obtained, a recession of the opposite inferior rectus can be done.

It is my belief that many, if not the majority, of symptoms in paresis of the superior oblique stem from the loss of torsional effect and, in my own experience, if this is alleviated it is seldom necessary to recess the opposite inferior rectus.

In some cases of superior oblique palsy one may find a secondary spasm of the ipsilateral inferior oblique. If this is marked it may be necessary to perform a recession of this inferior oblique. I believe that this operation should also be deferred until the weakness in the superior oblique is corrected; then, if the secondary spasm of the inferior oblique is causing symptoms or there is still a marked vertical deviation, the recession of the muscle may be carried out.

Evaluation of procedures

It has been shown that at the present time there are three accepted methods for strengthening the superior oblique. As is perfectly natural some criticism has been made of all of these procedures. Wheeler's method of advancement of the tendon has two disadvantages: (1) There is the definite possibility of a failure of a firm healing union between the advanced portion of the tendon and the globe; and (2) the point of insertion of the sutures is dangerously close to the macula and, theoretically, could possibly produce macular damage.

My method of resection of the tendon has principally been condemned because in this procedure the superior rectus is tenotomized, and some feel that following this there is danger of adhesions forming between the belly of the superior rectus and the tendon of the oblique. Conversely, the tucking procedure as advocated by McLean has been crticized because the superior rectus was not tenotomized and some operators feel that inadequate exposure of the oblique tendon is obtained in this operation.

Fink[8] believes that the tucking operation is the better procedure for the occasional operator and strongly condemns the tenotomy of the superior rectus in resection of the tendon of the oblique. In my hands, the resection of the tendon has given more correction than has the tucking procedure.

As for the debate as to whether to cut or not to cut the superior rectus, it seems obvious to me that with tenotomy of this muscle far more adequate exposure is obtained. In operating upon the superior oblique we are working on a region of the globe where it is many times difficult to see what one is doing and therefore I like to obtain all of the exposure that is possible.

It is entirely possible that in the operation for retinal detachment on the upper part of the globes following tenotomy of the superior rectus, we may find adhesions between the rectus and the sclera, and possibly the tendon of the oblique may be involved in

these adhesions, but I believe these adhesions are probably due to inflammatory changes in the sclera secondary to the detachment operation and not simply to the tenotomy of the rectus. In some 65 cases upon which I have done a resection of the superior oblique with tenotomy of the rectus I have had no noticeable difficulty with postoperative adhesions between the oblique and the rectus.

Conversely, it would seem that more trauma is produced by tugging and hauling the rectus to one side or the other than simply by cutting the tendon at the insertion and gently retracting it.

I do not intend to condemn any of the accepted procedures for strengthening the superior oblique. I feel they are all good surgical procedures, and regardless of which one the individual surgeon selects, I think they will all benefit the majority of cases.

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SENILE CHANGES IN THE CRYSTALLINE LENS

What is the proportion of real senile cataracts in old patients on whom a lens-extraction operation is performed?

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Our knowledge on the subject of cataract formation is far from satisfactory and consequently the different types of cataract as we find them described in the literature quite often lead to confusion.

The different types of changes which occur in the lens after a certain age have been accurately described and interpreted by many authors, who have classified them as logically as they saw the problem. In some textbooks, however, descriptions of crystalline-lens changes recorded in the pre-slitlamp era add one more misleading element to the actual approach to the subject.

Definition of senile cataract

The definition of senile cataract as it was given by Hess,[4] in 1911, is a clear-cut assumption of how much is not known. According to Hess, senile cataracts are all forms of opacities occurring in older persons without any direct, local, or constitutional cause for the opacity. Bellows[2] emphasizes the fact that "there is no sharp division between senile cataract and some forms of presenile opacities, although the former may supervene upon the latter."

According to Vogt[7] and to Bellows,[3] pre-

senile and senile cataracts can be classified as follows:

1. Coronary opacities (including cataracta cerulea and virides), consisting of club-shaped opacities located in the middle and deep layers of the equatorial cortex.

2. Punctate opacities lying in the cortex. If they gather in a concentric form in the region of the nuclear equator, they resemble a lamellar opacity.

3. Cupuliform or posterior saucer-shaped cataracts, beginning directly beneath the posterior capsule, which should be differentiated from cataracta complicata; in the latter, the opacities spread axially.

4. Nuclear cataract starting first in the central interval and eventually reaching the senile nuclear surface.

5. Senile cortical cataracts with water fissures and lamellar separations, spoke-and-wedge formation.

Incidence

The senile type of cataract, especially in its early stages, seems to be very common, and the senile types of opacities are to be found in 65 percent of all individuals between 51 and 60 years of age, according to Horlacher;[5] and in 90 percent of all individuals above the age of 60 years, according to Barth.[1]

The frequency of the different types of senile cataract according to Kirby's[6] statistics, based on the examination of 856 cases, is as follows: Cortical, 52 percent; nuclear, 29 percent; nuclear and cortical, nine percent; coronary, 4.5 percent; nuclear and cupuliform, four percent; cupuliform alone, 3.5 percent; cortical and cupuliform, 2.5 percent.

It should be noted that the cupuliform senile cataract, either alone or associated with the nuclear or cortical changes, occurred in 10 percent of all cases in Kirby's statistics.

Differential diagnosis

Statistics about the incidence of cataracta complicata do not seem to be available and the differential diagnosis of cataracta complicata and other forms of cataract, such as the heat (glass-blowers') cataract, the X-ray and radium cataracts, traumatic rosette cataract, cupuliform or posterior saucer-shaped cataracts, is not always easy, and the findings are frequently confusing.

In the case of the glass blowers' or heat cataract, the capsular splitting in a single lamella contrasts with the irregular advance of the axial opacities of cataracta complicata and, in a case history, other data could be of great help.

In the case of X-ray or radium cataract, it is an accepted fact that the typical lesions of radiation cataract are plaquelike opacities in the region of the posterior pole, surrounded by powderlike opacities and densest on the posterior pole. These opacities are sharply defined anteriorly and equatorially. Here again the case history would be of help by informing whether or not the patient had been exposed to radiation.

When it comes to differentiating traumatic rosette cataracts from cataracta complicata, difficulties in establishing the differential diagnosis are much greater; regarding the appearance of the lesion the only difference is the limitation of rosette cataract to one layer versus the spreading of the complicated cataract through several layers of fibers and a more pronounced demarcation of the lesions in the rosette traumatic cataract. The data in the case history would not be of great help, as the trauma could have caused an inflammation of the inner eye which, in turn, caused cataracta complicata.

In the case of cupuliform saucer-shaped cataract, differentiation is still more difficult, since in both this type and in cataracta complicata there is iridescence visible with the mirror illumination in the slitlamp, the only difference being the more defined demarcation of the changes in the cupuliform cataract and the lack of tendency to spread axially.

TABLE 1

OPACITIES FOUND IN 1,000 UNSELECTED CASES

Age (years)	No. Patients	No. of Cases with Iridescent Posterior Lens Capsule	Percentage
	602 Females		
45–50	162	10	6.6
50–55	162	12	7.4
55–60	192	18	9.4
60–65	96	6	6.2
	602	46	7.8
	398 Males		
45–50	104	8	7.7
50–55	154	12	7.8
55–60	92	7	7.6
60–65	48	4	8.3
	398	31	7.3

POSTERIOR CHANGES IN LENS CAPSULE

During the past five years, I have had my attention called to the high incidence of posterior changes in the lens capsule where, in spite of the fact that in many cases there did not seem to be any subjective symptoms, with the aid of the slitlamp, a typical iridescence of brilliant colors could be seen on the region of the posterior pole. These changes are easily differentiated from the embryonal remains which, to a greater or lesser degree, are always seen in that region of the lens.

In a series of 1,000 patients of both sexes taken at random, whose ages varied from 40 to 65 years, these opacities were to be found as shown in Table 1.

DIAGNOSTIC TESTS

In all 77 patients who showed lens changes, the following tests were made: (1) Examination by a syphilis specialist; (2) examination by a tuberculosis specialist; (3) blood count; (4) examination for toxoplasmosis; (6) examination for infected teeth (X ray); (7) examination of the intestinal tract; (8) examination of the gall bladder; (9) examination of the appendix; (10) examination of the genito-urinary tract; (11) skin sensitization for the 42 strains of streptococcus pathogenic for humans. The sensitization tests were done in only 32 cases, because only within the last two years has it been possible to have this test done at all in our city.

Of the 77 patients, three had a positive test for syphilis and four for tuberculosis (one also had infected teeth). The blood counts showed substantial changes in 67 of these patients; the toxoplasmosis test was positive in one case only. Infected teeth were found in 38 cases; infected tonsils in 15 cases; changes in the intestines were found in six patients, two of whom also had infected teeth; infected gall bladder in five cases; a chronic appendicitis in three cases; foci of infection in the genito-urinary tract in four cases, one of which also showed infected teeth.

Of the 32 cases for which we had access to a skin sensitization test for streptococci, all showed positive results for one or more strains.

Of the 77 cases with signs of cataracta complicata, only five did not have any other type of opacity in the lens; 41 had signs of cortical cataract alone; 23 had signs of nuclear cataract alone; three had signs of cupuliform cataract; and 10 had signs of both cortical and nuclear cataract.

Three patients, aged 60, 62, and 64 years, respectively, who had been operated on for cataract in one eye at another clinic, had uveal reaction of long duration after the operation. In the other eye, where there were only slight cortical and nuclear opacities, examination with the slitlamp and the mirror-reflection method showed typical iridescence of the posterior capsule. All the aforementioned tests were made in these three patients. In all of them there was a substantial change in the hemogram, and there were positive skin sensitization tests for streptococci. In one case there was an infected gall bladder, in another chronic appendicitis, and in another a focus of infection in the genito-urinary tract.

If the nuclear and cortical opacities had been more pronounced, obviously it would

have been impossible to see the typical iridescence of the posterior capsule and the diagnosis of cataracta complicata naturally would have been overlooked.

Therefore, it seems obvious that, in order to prevent uveal complications after intraocular surgery, signs of cataracta complicata should be looked for in all cases. In many of them, however, when cortical or nuclear opacities render the examination of the posterior capsule impossible, the only resource is to have all the tests herein outlined done before surgery, in order to find out if there is any etiologic factor of a potential uveal reaction.

Summary and Conclusions

Comments are made on the subject of our scanty knowledge regarding the formation and development of crystalline-lens opacities. The frequency of the so-called senile changes in the crystalline lens after the fourth decade of life are emphasized, and the difficulties in the differential diagnosis of the different forms of cataract are mentioned.

The results of slitlamp examination of the eyes of 1,000 patients during the last five years are mentioned. In 77 individuals, definite signs of mild cataracta complicata were seen, frequently associated with other forms of opacities, either cortical or nuclear or both.

These patients were examined carefully for possible etiologic causes of uveitis and in all of them positive results were found.

Since the diagnosis of cataracta complicata is only possible when the crystalline lens has sufficient transparency, in most cases of advanced cataract in older people, it is impossible to ascertain whether there are changes in the posterior capsule or not.

Since in 7.7 percent of patients between 40 and 65 years of age with otherwise normal eyes, definite signs of cataracta complicata were found and since in every case an etiologic cause of uveitis could be found, it seems advisable to have all possible tests made before attempting the removal of a so-called senile cataract which may have been superimposed on a complicated cataract.

The predominance of association of signs of cataracta complicata with the cortical type of senile cataract (51 out of 77 vs. 33 associated with the nuclear type) does not seem to be of any significance, since the cortical type of senile cataract is much more common than the nuclear type.

1151, Consolação.

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OBSERVATIONS CONCERNING CATARACT SURGERY

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In preparing a paper in which brevity is an essential element, it seemed to me best to give my personal observations and experiences gained in 32 years of attempting to remove the diseased crystalline lens in the safest possible manner. Therefore, there will be no bibliography and no historic review.

First I must pause briefly to pay tribute to my friend of many years, Dr. Lawrence T. Post, and to say how happy I am to be among those asked to contribute to this meeting. I shall not attempt to enumerate his many contributions to our specialty, for that will be done by others, but I wish for him many more happy years in the work he loves so much, after laying aside the arduous teaching program that has engaged him for so long.

Ophthalmologists who have begun their work within the last two decades can scarcely conceive of the improvement in technique that has taken place since a somewhat earlier day. When I began to operate in 1921, Angelucci had described the superior rectus suture and van Lint his method of akinesia, but no one paid much attention to them.

Preoperative sedation if used at all was limited to a dose of bromides or chloral hydrate. Barbiturates were unknown and so were vitamins. No one dared to use retrobulbar injections except for enucleation.

If sutures were used at all, they were to hold a conjunctival flap in place. Some surgeons extracted the lens under a bridge—a rather awkward procedure. No one in this country intentionally removed a lens in capsule, though not a few were so delivered accidentally when the patient squeezed at a crucial moment and propelled lens and vitreous out simultaneously.

Speed and operative skill were essential, for the incision should be made, the lens delivered, and the wound closed before the patient squeezed or tried to get off the table. As the patient usually turned his eye up in spite of the surgeon's pleas to "look down," it was often impossible to complete the toilet of the wound.

Residents were taught to make an incision in the right eye with the right hand, in the left eye with the left hand, and woe to patient and doctor if the surgeon failed to develop a certain amount of ambidexterity. No one thought of or dared to advocate the lowly keratome for a cataract incision.

The first intentional intracapsular extraction I ever saw attempted was by Col. Henry Smith, the English general surgeon who was reputed to have done 50,000 cataract operations in India. There must be some difference in the strength of the zonule in Americans and Indians, because Colonel Smith pushed a great deal of vitreous out with the lens in this country. After attempting this technique on one patient with the same result, I abandoned intracapsular work until it was modified by Dr. Elschnig, Dr. Knapp, and other ophthalmic surgeons.

As late as 1935, the standard technique at Moorfield's was for the surgeon to depress the point of the knife, cut the capsule and complete the incision. Six weeks later a discission was done to give the patient a clear pupil.

It is unnecessary to call attention to the improvement in technique that has taken place because these facts are too well known to warrant discussion. However, a cataract operation is still a major procedure to both patient and surgeon and should be undertaken only after careful and prayerful consideration.

INDICATIONS FOR CATARACT OPERATION

A brief consideration of the indications for cataract operation should be worthwhile. There is an ancient dictum that states that a cataract should not be removed as long as

the vision in the other eye is 20/70 or better, as the patient will still continue to use the unoperated eye and will not be grateful for the operation. This should be buried in the album of famous last words, along with the use of dionin, boroglyceride, lens antigens, and the more modern fish lens extracts used to prevent the growth of cataracts.

When a cataract becomes mature it should be removed unless the patient is too old or feeble to take the risk, because in a high percentage of cases of hypermature cataracts secondary glaucoma develops. How this comes to pass is not always clear, but glaucoma is usually due to toxic fluid seeping through the capsule and causing uveitis, or by lens material escaping through a small rent in the diseased posterior capsule. The anterior chamber is usually deep. While the cornea is too cloudy to see fine details, there are often no deposits visible on the back of the cornea. Usually the tension can be considerably reduced temporarily with miotics, but the lens should be removed in capsule without much delay. Excellent vision is often obtained if the situation is met promptly.

Another reason for removing a cataract when the vision becomes obscured is that such an eye will invariably diverge and if it remains out long, binocular single vision can never be restored, even when both cataracts are removed.

If a patient can be induced to stimulate convergence by practicing convergence every day with a pencil flashlight, this usually can be prevented. People in the active period of life will usually wear a contact lens successfully on the operated eye and get a sufficient degree of fusion to prevent diplopia. I have several patients who are very happy to have their monocular aphakia problem solved in this way.

Preoperative examination

One point in the preoperative examination of a candidate for cataract surgery is worth stressing. In immature cataracts, if the pupil is widely dilated, it is often possible to get a fair view of the macular region, provided the ophthalmoscope has a strong light. If a macular lesion is found, a guarded prognosis may save embarrassment when reading vision is not obtained. No other test will detect macular degeneration.

This seems too simple to be worth mentioning, but I have prevented many operations by a careful scrutiny of the macula. Severe endothelial dystrophy adds an extra hazard and it should be recognized and counted as such.

Thus far the discussion has been confined to cortical cataracts or those of the mixed type, for cataracts are seldom purely cortical or purely nuclear.

Nuclear sclerosis is an aging process and is seldom seen in the young except in the familial type that begins in early childhood. As a person grows older the original fibers are crowded to the center by the newer fibers that are formed throughout life, they desiccate and harden, and the index of refraction increases. Viewed with the biomicroscope the center of the lens is now amber-colored, changing to a dark brown with increasing age. If the lens flattens commensurate with the increasing sclerosis, the refraction changes but little.

Usually this does not happen and the eye becomes myopic. The patient can then read without glasses and this accounts for the tales we hear so often about "what fine eyes papa had because he could read without glasses until he died at 85."

These people are happier if never operated upon because they have the tremendous advantage of having two eyes with which they can see well enough for their needs; and they do not have to go through the distressing experience of trying to wear a cataract lens with the other eye occluded.

Not uncommonly we encounter persons in the third or fourth decade of life who have disabling lens opacities. These begin in the posterior subcapsular area and are usually familial. It requires considerable thought about the best way to manage these patients

as they have a long time to live.

I had such a patient, a young man in the early thirties, and having asked five different surgeons what to do, received five different answers. They ranged from the Homer Smith maturation operation to intracapsular extraction through a round pupil. I settled for a combined capsulotomy, irrigating the cortical material out under ultraviolet illumination. I am happy to report he sees well. I have done many capsulotomy operations with a round pupil on these young people, but it is not as safe as the combined operation, and a discission through a small occluded pupil is needed more often.

Congenital cataracts

A few words concerning congenital cataracts.

Those due to intrauterine inflammation are hopeless. Each operation makes them worse and they end in buphthalmos or phthisis bulbi.

Rubella cataracts afford a much better prognosis but other systems than the visual are also affected, and they do not turn out very well. In case both eyes are involved and the child is blind, it should have the first eye operated by the end of the first year.

My preference is the through-and-through discission described by Zeigler. Glaucoma never follows this operation, necessitating a hasty second operation to remove lens material.

Linear extraction is a dangerous procedure unless done with infinite caution and skill. It is very easy to lose vitreous through the small wound and a baby can prolapse an iris through a tightly sutured wound. However, if the lens material absorbs very slowly after discission of the first eye, a linear extraction should be done on the second eye. If the child sees well with the first eye, it is all right to wait a year or two on the second.

In monocular cataracts, early operation is not indicated because the eye will be amblyopic anyhow. Theoretically, it is best to operate early and put on a contact lens, but I have never seen a child under the age of 11 years who would tolerate one.

Present technique

I should like to repeat Dr. Kirby's statement that one's mind should not be static in surgery, but that a surgeon should be ready to adopt any measure that will improve his results. I have followed this plan sometimes for better, often for worse.

I adopted a corneal incision to minimize the danger of postoperative hyphema and encountered that of rupturing the capsule on the corneal shelf, and of epithelization. Now I would make a corneal incision only if the patient had a severe anterior chamber hemorrhage in the first eye, or to cut ahead of a filtering bleb in an eye previously operated for glaucoma. Once I adopted the Stallard suture so the wound could be closed quickly if necessary. This was abandoned. A mattress suture may turn the edges of the wound in and this is a prolific source of epithelial downgrowths. I should like to pay my compliments to those surgeons who never have downgrowths—and to express the opinion that they fail to recognize them.

To the patient a cataract operation is an ordeal by fire, and I often marvel that people entrust their sight to a surgeon they know so little about without being more nervous than they appear to be. The patient is entitled to enough anesthesia so that there will be no pain and enough sedation so he will be thoroughly relaxed. There are many ways of obtaining these results, varying from barbiturates and Demerol, through Jensen's method of intravenous morphine and scopolamine to sodium pentothal and curare. The important thing is to have the patient relaxed —and also the surgeon.

Briefly I have used the following technique for about 18 months and have found it satisfactory enough so far. Cocaine and adrenalin anesthesia is used and Nembutal with Demerol and Dramamine, in amounts sufficient to relax the patient. If they come to the table wide awake and sometimes vomiting

from apprehension, they are given more sedation.

A retrobulbar injection of four-percent procaine with two drops of 1:1,000 adrenalin and six units of Hydase per cc. is made before the surgeon starts to scrub. As soon as the needle pierces the tarso-orbital fascia, the plunger is depressed continuously until it comes to rest within the muscle cone. An orbital hemorrhage will not occur if the injection is made in this way. If the patient is heavy set and has prominent eyes, the nurse makes pressure over the eye while the surgeon scrubs.

Van Lint akinesia is used and a canthotomy is done if there is any pressure on the eye as the speculum is slipped sideways. A lid suture is inserted in upper and lower lid and a superior rectus suture is placed after injecting the muscle with a drop or two of procaine.

The limbus is circumcised from the 9- to 3-o'clock positions, making sure that no epithelial tags are left attached at the limbus. This flap is loosened from the globe well back with scissors. Bleeding points are stopped with a hot point. Plain catgut sutures are passed through the episclera nasally and temporally somewhat below where the conjunctival incision ends and these are laid to one side.

The incision is made through sclera with a keratome and enlarged by scissors. The iridotomy or iridectomy is done and three 6-0 mild chromic radial sutures are inserted. These are not difficult to place exactly opposite each other in the lips of the wound if a sharp-toothed forceps is used and the sclera is lifted constantly forward. Knots have been tied in each suture previously so that the sutures can be pulled up to close the wound if necessary without loss of time. The atraumatic needles are often not very sharp, and I have recently had the catgut threaded upon Grieshaber needles.

The lens is then removed within capsule, either with a suction cup or by Arruga forceps. For intumescent lenses with tense capsules and in nuclear cataracts which often have thin capsules, suction is the best method. The little cup and bulb devised by Bell is as good as all the fancy apparatus with motors and it is much less expensive.

It is better in most cases to remove the speculum before starting delivery of the lens. Any speculum takes up space in the orbit and causes some pressure on the globe. It may mean the difference between a ruptured or intact hyaloid and vitreous prolapse.

The loss of a small amount of formed vitreous is a very unwelcome complication. These eyes never do as well afterward as those without vitreous loss.

After the wound is closed and before the flap is tied, a bubble of air is blown in to force the vitreous back. This should not be done in case the anterior chamber has filled suddenly, for in this case the hyaloid has ruptured and vitreous fills the anterior chamber. In this event the air will enter the vitreous instead of pushing it back.

If vitreous prolapses during a round-pupil extraction, the iris should be incised through the iridotomy to the pupillary border. If vitreous presents before the lens is extracted, the lens should be removed by traction and torsion with the capsule forceps rather than with a wire loop as we have been taught.

It is very important not to rupture the capsule if formed vitreous is lost. If the upper zonule has ruptured and the hyaloid is intact, the lens may be grasped above near the equator with the capsule forceps and teased out in this manner without rupturing the hyaloid.

Postoperative phase

In the postoperative phase of cataract surgery, we have been entirely too conservative. It is unnecessary to bandage the unoperated eye. Patients do better if they are out of bed the first or second postoperative day. This prevents the back and shoulder pains that annoy so many persons who are kept in bed and also the occasional thrombophlebitis of a femoral vein. If the wound is covered

by a flap, cortisone does not interfere with healing. The ointment is instilled with each dressing after 48 hours and unquestionably keeps down tissue reaction.

When the patient returns to the office on about the 10th or 12th day, one should examine the eye with the biomicroscope. It takes about two weeks for the corneal striae to disappear in uncomplicated cases. The observer notes the condition of the cornea, also whether the hyaloid is intact or ruptured.

Persistent striae are due to something abnormal touching the back of the cornea. This is either hyaloid, iris, or lens capsule. If the hyaloid is ruptured, the vitreous touching the cornea does no harm.

Any other abnormal structure touching the back of the cornea must be promptly separated and kept from reattaching, else the striate keratitis persists and bullous keratitis with a useless eye results.

Epithelial downgrowth

There is time left to discuss but one postoperative complication—epithelization. This is much commoner than statistics show. In the absence of postoperative uveitis or loss of formed vitreous, any aberrant membrane across the back of the cornea or covering the pupil must be regarded as a downgrowth. The only thing that will save the eye is to recognize the situation early and to start X-ray therapy at once.

We use 1,500 r as measured in air. The tube is set at 31.0 cm., using two inherent aluminum filters and a 2.1 cm. portal; 250 r are given daily for six doses.

The growth can be stopped, irritability abated, and secondary glaucoma prevented. However, I have never seen such an eye retain vision better than 20/70. It is a complication that is very serious and it is much better to prevent it than to treat it.

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THE USE OF PERITONEUM AS A SUBSTITUTE FOR CONJUNCTIVA IN PLASTIC SURGERY*

A preliminary report

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Since Van Millingen[1] first made use of buccal mucosa in the correction of trichiasis, mucous-membrane grafts have been used successfully in the correction of various small conjunctival defects. Other mucous membranes, including nasal mucosa,[2] rectal mucosa,[3] and genital mucosa[4] also have been used but the amount of material has been limited.

Sorsby[5] has found amniotic membrane useful in extensive burns of the conjunctiva but it has not been useful in my hands in extensive full-thickness defects of the conjunctiva. Thus, I have been interested in finding a satisfactory and adequate source of mucous membrane for use in extensive conjunctival defects.

Peritoneal mucosa, particularly omentum, was considered and discussed with several abdominal surgeons. It had several desirable characteristics. It was moist, transparent, relatively easily separated from its submucosal tissue, and was available in sufficient quantity to replace the entire conjunctiva of one or both eyes, if necessary. Furthermore, according to the abdominal surgeons, with present techniques the elective removal of a piece of omentum from a normal abdomen should not appreciably increase the surgical

* From the Department of Ophthalmology, Tulane University of Louisiana School of Medicine. This study was supported in part by funds provided under contract AF 18 (600)-304 with the USAF School of Aviation Medicine, Randolph Field, Texas.

risk of an extensive reconstruction of a large conjunctival defect; neither should it prolong the convalescence. Therefore, peritoneum was used as a substitute for conjunctiva in two cases of severe contraction of the socket and, later, in two other patients in an effort to prepare them for corneal transplantation operations.

In each of the four cases, the patient was examined preoperatively by the abdominal surgeon who later removed the omentum, and by the anesthetist as well as the ophthalmologists. Consent for the operation was taken only after the general examinations had been found satisfactory and the patient had been warned of the possible hazards and risks.

At the time of operation, the abdomen and the eye were prepared simultaneously. The surgical team obtained the piece of omentum through a small muscle-splitting incision and placed it on a sterile saline-soaked gauze sponge. The omentum and gauze then were placed in a sterile-covered beaker until needed. As the surgeon was closing the abdomen, the ophthalmic team began its work on the eye.

The patient was allowed to sit up the day after the operation and to be up as desired, thereafter. In each case the abdominal wound was healed and the surgeon's duties completed by the seventh postoperative day.

Case reports

Case 1

W. L. S., a 29-year-old unmarried white man, entered the hospital for the repair of a severely contracted right socket. The right eye had been injured and infected in an automobile accident approximately two years previously. The eye had been enucleated and a buried muscle-cone implant of the Hartman type inserted.

The postoperative course had been characterized by swelling of the lids and discharge from the socket. After prolonged treatment the swelling and discharge had subsided but the socket had contracted and the implant had been partially exposed. Approximately one year after the injury he had had a buccal mucous membrane graft to the socket with the result that the implant had been covered but the socket had continued to contract slowly.

Admission examination revealed only a slit between the closed immobile lids. The fixed muscle-cone implant could be palpated through moderately thick scar tissue.

Under general anesthesia, a lateral canthotomy was made and the scar tissue dissected from the inner aspects of the lids down to the tarsal plates. The scar then was dissected from the fornices and the region of the anterior portion of the extraocular muscles, leaving a layer of tissue over the anterior surface of the implant.

While bleeding was being controlled by pressure in this bed, a dental wax stent was molded to the shape and size of the desired socket. The omental mucosa was prepared for use by separating it from all submucosal tissue.

The wax stent was then completely wrapped with the mucosa with the peritoneal surface turned inward toward the stent. Without disturbing the position of the mucosa, the stent was inserted into the now dry bed and held carefully in place until the lateral canthotomy was repaired and two previously prepared intermarginal tarsorraphies closed by double-armed, 4-0 black-silk sutures tied over small buttons.

A pressure dressing was applied and left in place for seven days. The tarsorraphies were severed and the stent removed in eight weeks. A conformer was given for wear but, in the course of six weeks, it became impossible to reinsert it.

Examination at that time revealed constriction of the opening of the newly made conjunctival sac by the development of bands of scar tissue just within the margins of the lids and running parallel with the margins except at the angles where they seemed to connect and further constrict the opening. Dissection and removal of this scar together

with a thin layer of underlying tarsus resulted in the formation of a socket which permits the wearing of a satisfactory prothesis even though it shows very little movement.

CASE 2

J. T., an unmarried white woman, aged 34 years, entered the hospital complaining of the unsightly appearance of a severely contracted socket and the inability of obtaining a satisfactory prosthesis. An enucleation 18 years previously for panophthalmitis had been followed by contraction of the socket so that the patient had never been able to wear an artificial eye. More recently, attempts to obtain a partial mask type prosthetic appliance had not been successful.

Examination revealed the patient had had a simple enucleation of the left eye. The lids were drawn together and firmly bound to the underlying tissues. There was no demonstrable mucous membrane or socket.

Under general anesthesia, a lateral canthotomy was made. The tarsal plates were located and a thin section of tarsus removed from the posterior surface of each in freeing the lids from the underlying scar. The line of dissection was carried to the margin of the bony orbit below and laterally but was turned inward and upward just above the upper tarsal plate for a depth of approximately three cm. from the margin of the upper lid.

After the lids were freed, the scar in the superficial portion of the orbit was removed. While the bleeding was being controlled by pressure, a dental wax stent was molded to the desired shape and covered with omental mucosa as described in Case 1. The covered stent was placed in position under the lids and the lids closed by repairing the lateral canthotomy and closing two intermarginal tarsorraphies.

A pressure dressing was applied for seven days. The tarsorraphy sutures were removed on the 12th day but the tarsorraphies were not severed for four months after the operation. After the stent was removed, a plastic conformer was inserted until a prosthesis was made. The result was satisfactory although the artificial eye was immobile.

CASE 3

C. S., a 51-year-old white man was practically blind in each eye because of superficial scarring and vascularization of the cornea resulting from a chemical burn.

In an effort to prepare the patient for a corneal transplantation operation, peritomies and irradiation had been used to destroy the superficial corneal vessels but without success. Because of the successful use of peritoneum in two previous cases, it was decided to make a final effort to eliminate the corneal vascularization by making a superficial keratectomy and removing a wide band of conjunctiva and subconjunctival vessels from around the cornea, covering the defect by peritoneal mucosa.

Under general anesthesia, a superficial keratectomy was made from a cruciate incision. In addition, all conjunctiva and subconjunctival tissue was removed from a zone extending six mm. outward from the limbus. A piece of omental mucosa, approximately 30 mm. in diameter and freed from all submucosal tissue, then was sutured into place in the defect.

A double-armed, 6-0 black-silk suture was placed superficially in the sclera near the limbus, then each arm passed through the mucosa and tied. Four sutures of this type were used, one each at the 12-o'clock, 3-o'clock, 6-o'clock, and 9-o'clock positions. The edges of the graft were then attached to the edges of the conjunctiva on either side of the four recti muscles. At each of these locations, a single-armed, 6-0 black-silk suture was passed through the conjunctiva, Tenon's capsule, and, finally, the omental mucosa and tied.

The eye was covered with a pressure dressing for five days. Healing was followed by the superficial extension of vessels into the cornea but for a distance of not

more than two mm. from the limbus at any point. Approximately six months later a successful corneal transplantation operation was made on this eye.

Case 4

P. J. D., a 32-year-old white man, also had superficial scarring and vascularization of the cornea following a chemical burn. Irradiation therapy and peritomies had failed to eliminate the vascularization; therefore, an operation identical with the one described in Case 3 was made.

Following superficial keratectomy and removal of conjunctiva and subconjunctival tissue from a zone extending six mm. outward from the limbus, an autogenous peritoneal mucosal graft, approximately 30 mm. in diameter, was sutured in place to cover the defect.

Slight superficial vascularization of the cornea has recurred in the four months following surgery but the patient is now ready and waiting for a full-thickness corneal graft.

Discussion

The use of peritoneal mucosa as described herein has not been devised as a replacement for procedures employing other mucosal substitutes for conjunctiva but rather as a supplementary technique to be used only in cases in which the other methods do not provide an adequate amount of mucous membrane.

In the above-reported cases, complete or extensive conjunctival replacement was necessary. In the two cases of socket reconstruction, the repair might have been made in several stages, except that economic and other considerations made it desirable to obtain results as quickly as possible. In the latter two cases, success of the operation was dependent upon the immediate availability of a sufficient and satisfactory substitute for a large amount of conjunctiva.

The question of increased risk to the patient was considered. The risk of infection of the peritoneum under present methods of elective abdominal surgery is negligible, certainly much less than the risk of infection following intraocular surgery and much less than the risk of infection at the donor site following buccal, rectal, or genital mucosal grafts. Furthermore, since the peritoneum is sterile, there is much less danger of transferring infection to the graft site.

The risk as a result of the use of general anesthesia, perhaps, is greater than the risk of infection, but it also is slight. In fact, when it is considered that the use of peritoneal mucosa is advocated chiefly in those cases in which multiple procedures might otherwise have been necessary, it raises the question whether the total risk is not reduced. Nevertheless, the risks were and should be explained to each patient.

Summary and Conclusions

The successful use of autogenous peritoneal grafts as a substitute for conjunctiva is reported in two cases of extensive reconstruction of contracted sockets and in two cases following superficial keratectomies and extensive removal of bulbar conjunctiva.

The grafted material is a satisfactory substitute for conjunctiva.

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IRIDECTOMY FOR DRAWN-UP PUPIL

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The operation to be described was designed primarily for cases of markedly drawn-up pupil after iridencleisis for congenital glaucoma. The glaucoma may be controlled but, in some cases, the pupil is drawn up so that vision is seriously affected.

The cornea may be quite large, and the problem is to provide a central pupil without damaging the lens. Iridotomy with scissors runs the risk of injury to the lens. If a limbal incision is made and an attempt made to pull the iris out of the wound for iridotomy or iridectomy, an iridodialysis may be produced, due to the width of the cornea.

The operation is performed as follows:

A slanting incision with a keratome is made in the lower cornea from below upward. The tip of the keratome is engaged in clear cornea one to three or four mm. from the limbus, depending on the corneal diameter.

The incision is slanted so that the tip of the keratome enters the anterior chamber just below the center of the cornea (fig. 1). The opening into the anterior chamber should be about four mm. long.

Iris forceps without teeth are introduced, the iris is grasped (fig. 2), pulled out of the wound, and a small iridectomy done (fig. 3).

The iris readily retracts into the anterior chamber, and the anterior chamber is formed by air injection. The air is retained and no suture is required because of the valvelike closure of the wound. Due to the vertical lines of force, the pupillary opening is always oval, with the long axis vertical (fig. 4).

Figure 5 is a photograph of an eye on which the operation was performed. Too large an iridectomy was done, resulting in

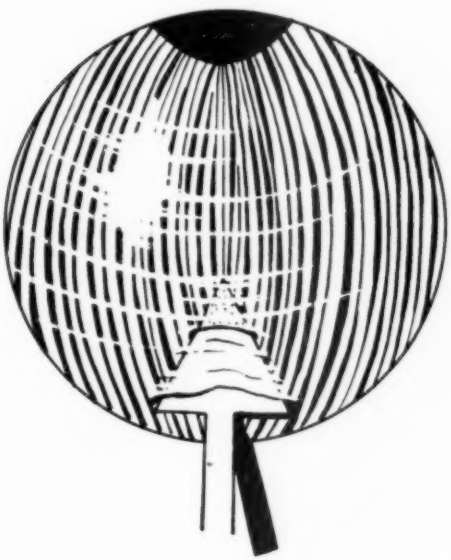

Fig. 1 (Chandler). The tip of the keratome enters the anterior chamber just below the center of the cornea.

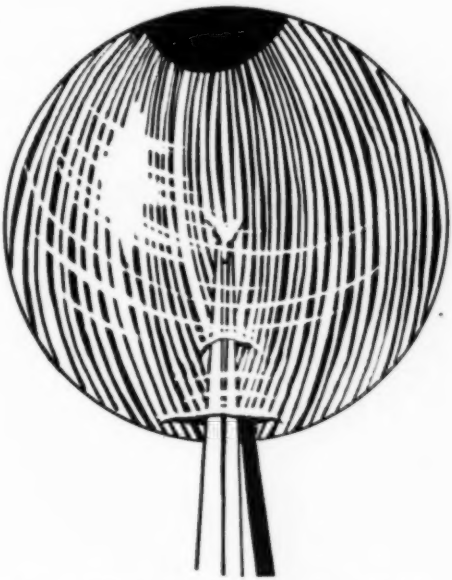

Fig. 2 (Chandler). The iris is grasped by iris forceps without teeth.

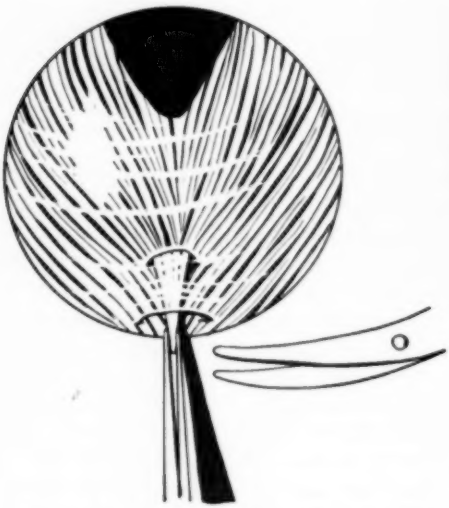

Fig. 3 (Chandler). A small iridectomy is done.

an unnecessarily large opening. Only a very small iridectomy is required.

Franceschetti[1] has described a somewhat similar procedure (fig. 6). With an incision behind the limbus, he introduced a blunt iris-hook which is hooked around the pupillary border. The iris is pulled out and an iridectomy is done, including the sphincter of the iris, thus providing in effect a vertical iridotomy. This is perfectly satisfactory

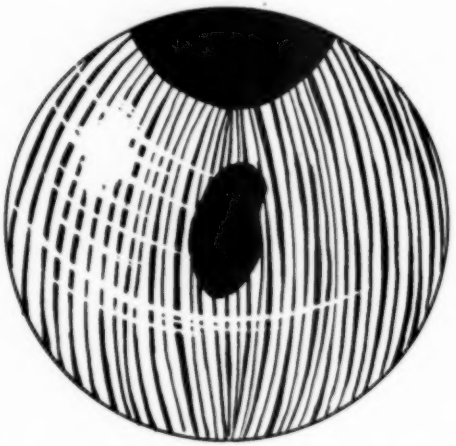

Fig. 4 (Chandler). The pupillary opening is always oval, with the long axis vertical.

Fig. 5 (Chandler). An eye on which the operation was performed.

from a visual standpoint, not quite so satisfactory cosmetically, and, with a conventional incision outside the limbus, there is always the possibility of wound bleeding.

The operation described is applicable to cases of known intracapsular extraction of senile cataract with drawn-up pupil. It has an advantage over conventional iridotomy with knife or scissors since it entails no disturbance of the vitreous. It was used very satisfactorily in one case in which the pupil was markedly drawn up after an iridectomy and linear extraction had been done for congenital cataract.

Fig. 6 (Chandler). Technique of Franceschetti. (From Klin. Monatsbl. f. Augenh., **103**:459-466, 1939.)

In cases of extracapsular extraction with drawn-up pupil in which there may be a membrane behind the iris, probably conventional iridotomy with knife or scissors is preferable. If only iridectomy, as described, is done, one may find a membrane in the new pupillary opening which might require a discission.

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AKINESIA OF THE ORBICULARIS

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Since van Lint,[1] in 1914, first advocated a block of the facial nerve to produce a temporary paralysis of the orbicularis muscle, many modifications have been proposed.[2]

In his original communication, van Lint[1] stated that he preferred to make the injection in the region of the terminal branches of the facial nerve and thus localize the paresis to the orbicularis muscle. In the same article, van Lint pointed out that the injection may be made around the trunk of the nerve but this would cause a paralysis of all branches of the nerve, which is undesirable. This reference is given to emphasize the fact that it was van Lint who first made the outstanding contribution of advocating a block of the facial nerve, either the terminal branches or the trunk, to produce temporary paralysis of the orbicularis muscle.

His directions for making the injection are briefly as follows:

Introduce the needle one cm. back of the intersection of a horizontal line extending from the lowest part of the inferior margin of the orbit and a vertical line from the most temporal part of the lateral margin of the orbit (fig. 1). The needle is introduced as far as the bone and directed inward and slightly downward into the deep tissues just below the orbital margin. The injection is given as the needle is withdrawn. Through the same opening in the skin, the needle is again inserted as far as the bone and directed upward and inward near the orbital margin close to the bone.

It is strange that no eye surgeon thought of blocking the facial nerve earlier since shortly after Koller[3] introduced cocaine in 1884, Hall and Halsted[4] reported injecting cocaine to produce a nerve block. So for nearly 30 years after it could have been prevented, many eye surgeons saw vitreous lost and eyes needlessly damaged by contractions of the orbicularis muscle.

The injection of the trunk of the facial nerve where it leaves the skull, which was advocated by Wright,[2-C] has been used comparatively little; because, as pointed out by van Lint, a block of all the branches of the nerve is not desirable.

Wright's earlier suggestion[2-B] of a peripheral block deserved more attention than

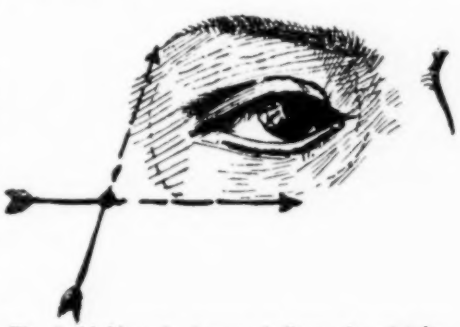

Fig. 1 (Atkinson). Arrows indicate site of injections. (From van Lint.)

Fig. 2 (Atkinson). Skull showing bony landmarks. The intersection of the black vertical line, one cm. posterior to the lateral margin of the orbit and lower edge of the zygoma, is the site where the injection is begun. The needle is shown in position along the lower edge of the zygoma extending upward and across the zygomatic arch.

it received. It modified the van Lint method by changing the vertical injection of the van Lint procedure, which is along the temporal margin of the orbit, to a horizontal injection extending to the pinna in line with the injection below the orbital margin. Wright briefly describes the location used by van Lint to start the injection as the "center of the zygoma." From this point the horizontal injections are made; one to the pinna and the other to a point below the center of the eye. By this modification, one of the injections at the orbital margin, which might infiltrate the lids, is avoided.

Of the many sites advocated for the injections to produce akinesia of the orbicularis, the two most commonly selected are the peripheral branches of the facial nerve near the orbital margin, as preferred by van Lint, and a more proximal site in front of the tragus of the ear where the nerve crosses the condyloid process of the inferior mandible, as advocated by O'Brien.[2-D]

The disadvantages, most frequently mentioned, of making the injections near the orbital margin to block the terminal branches are:

1. Ballooning or edema of the lids may be produced.

2. More of the anesthetic solution is required than for a more proximal block, which increases the risk of a toxic reaction from the anesthetic agent.

The disadvantages of the more proximal injection of the trunk of the temporofacial nerve as it crosses the condyloid process are:

1. It is often missed.

2. The lower branches that supply the lips and face may be blocked producing a facial paralysis, which is disturbing to patients, particularly if the paralysis lasts for a number of days.

3. Pain is often experienced at the time of the injection and, on moving the jaw, for several days after the injection.

To overcome these objections, a different site has been chosen which extends along the inferior edge of the zygomatic bone and

Fig. 3 (Atkinson). Approximate distribution of the facial nerve from which it can be seen that an injection made along the inferior edge of the zygoma and upward across the zygomatic arch blocks the branches to the orbicularis without blocking the lower branches. The facial artery and vein, which should be avoided with the needle, are also shown. (From Sobotta).

Fig. 4 (Atkinson). Injections along the lower edge of the zygoma and upward across the zygomatic arch close to the bone. The index finger is placed over the zygomatic arch anterior to the ear to protect the facial vessels and to indicate the direction the needle should follow and where it should stop in order to avoid piercing the facial vessels.

upward across the zygomatic arch (fig. 2). By placing the injection lower than advocated by Wright, it is unnecessary to inject below the orbital margin to block completely the branches of the orbicularis. The injection is away from the orbital margin, so ballooning or edema of the lids does not occur and not as much of the anesthetic solution is required. It is more proximal than the van Lint or Wright injection and yet more peripheral than the O'Brien, so that the lower branches that supply the lips and face are avoided (fig. 3). For this injection, the bony landmarks are easy to find even in fleshy patients.

A 23-gauge needle,* 3.5 cm. long with rounded point, the same as is used for retrobulbar injections,[5] is satisfactory for this injection. It is introduced through an intradermal wheal at the lower edge of the zygomatic bone (fig. 4) about one cm. posterior to the intersection of a vertical line drawn from the lateral margin of the orbit and a horizontal line along the lower edge of the zygomatic bone. The injection is made along the lower edge of the zygomatic bone and upward across the zygomatic arch close to the bone. The anesthetic solution is injected as the needle advances.

The index finger of the other hand is placed over the arch of the zygoma just anterior to the ear and over the facial artery and vein. This is done to protect the facial vessels (fig. 3) from being pierced by the needle and to indicate the direction the needle should follow and where it should stop.

About three cc. of the anesthetic solution are injected. If firm pressure is exerted over the site of the injection, a more rapid and complete block is obtained.

This site lends itself admirably for injections to produce akinesia of the orbicularis and particularly for prolonged akinesia for the following reasons:

1. The landmarks are definite and easy to find.
2. Three cc. of the anesthetic solution is usually sufficient to produce complete akinesia of the orbicularis.
3. No ballooning or edema of the lids occurs.
4. Failure to secure a complete block is rare.
5. The lower branches of the facial nerve that supply the lips and lower muscles of the face are seldom blocked.
6. Postoperative pain on moving the jaw is not encountered.

Summary

Van Lint was the first to advocate a block of the facial nerve to produce a temporary paralysis of the orbicularis muscle.

The disadvantages of sites more commonly selected to block the facial nerve are enumerated.

A different site is suggested to overcome these disadvantages. It is along the inferior edge of the zygomatic bone and upward across the zygomatic arch.

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* Becton, Dickinson & Co., Rutherford, New Jersey.

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PREVENTION OF INFECTION IN OPHTHALMIC SURGERY*

Protection of instruments from dust-borne contamination and sterilization of certain solutions by ultraviolet radiation

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Before proceeding to a discussion of the scientific facts which my talk tonight will seek to bring to your attention, I feel that I should pause to speak for a moment concerning Dr. Lawrence T. Post, in honor of whom this program has been prepared. I have probably known him longer than anyone else. In fact, I have known him for all of 65 years, and have had the opportunity of close observation of his problems, his potentialities and attainments. By careful analysis, I find that the admirable far transcends all other qualities, and am convinced that he well deserves the tribute here being paid him.

Numerous experiments previously reported by me[1-4] have given ample proof that contamination of instruments does occur in the interval between sterilization and the moment of actual use in operation. It has been shown, furthermore, that much of this contamination takes place through the medium of dust-borne organisms.

Various methods have been reported whereby infection from this source can be greatly reduced. Briefly reviewed, it may be stated that for years it was routine for many eminent ophthalmologists to dip the ends of instruments which were to be inserted into the globe in boiling water a moment previous to their use. To avoid the obvious inconvenience of such a procedure, the substitution of 1/3,000 solution of aqueous zephiran chloride was suggested. The efficiency of both methods was tested, and that of the latter found to exceed the former by a considerable percentage.

It was known, however, that aqueous zephiran chloride of a concentration of 1/3,000, when injected directly into the anterior chamber of rabbits' eyes was likely to cloud the cornea for several weeks, and to create a localized atrophy of the iris in the neighborhood of the injection.

As a result of this observation, and from clinical experience, I have felt that, in some cases, in which an excessive amount of zephiran chloride might have been carried by the instrument into the eye, an unusual amount of postoperative inflammation had

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taken place. Another method, free from such drawbacks, was therefore sought.

Some previous study of the effects of germicidal lamps of 2,537 angstrom units suggested the possible use of such equipment. Two General Electric lamps, known as G-15, T-8, were, therefore, installed in an ordinary floor stand. These lamps have been in use in all intraocular surgery done by me during the past year and a half. Not a single case of infection has occurred. The results of this work were reported in a paper entitled, "Prevention of infection in ophthalmic surgery: Further studies," read before the meeting of the American Ophthalmological Society in June, 1952.[4]

In the first two experiments reported at that time, it was shown that sterile instruments contaminated by spraying, as they lay upon a sterile table, with a solution having a high content of bacillus subtilis, could be resterilized by exposure to germicidal lamps. Two G-15, T-8 tubes were suspended at a distance of 12 inches above the instrument table. Sterilization of these instruments, and along with them tryptase dextrose agar plates, was complete for the former in 20 minutes, and for the latter in 25 minutes.

In a third experiment, sterile instruments were laid out in the operating room and allowed to stand for 10 minutes, unprotected by radiation, at which time initial counts were made, showing a considerable bacterial invasion. The ultraviolet lamps were then started. In one series, one colony was found after 30 minutes, in the other, none. Nor were any found thereafter.

This work was further elaborated in a talk given in a course on "Operating room technique," conducted in connection with the American Academy of Ophthalmology and Otolaryngology, in Chicago, October, 1952.

In an experiment recorded at that time, instruments sterilized by a solution previously reported[1-4] were examined over a period of 90 minutes. They were laid out, along with agar plates, on Mayo tables in one of the operating rooms of McMillan Hospital, while, at the same time, three eye operations were in progress.

TABLE 1

IRRADIATION OF INSTRUMENTS IN OPERATING ROOM BY ULTRAVIOLET LAMPS (2537 A.) G-15, T-8

Time in Minutes Under Lamps	Number of Colonies on			
	Plate 1	Plate 2	Plate 1–2	Total
			2/5 of Total	
0	3	9	12	60
5	1	2	3	7
10	1	1	2	5
15	0	1	1	2
20	0	1	1	2
25	0	0	0	0
30	0	0	0	0
35	0	0	0	0
40*	0	0	0	0
45	0	0	0	0
50	0	0	0	0
55†	0	2	2	5
60	0	1	1	2
65	0	0	0	0
70	0	0	0	0
75	0	0	0	0
Control 80 min. on table uncovered without lamps	7	10	17	42

*† See text for details.

For the first 15 minutes the germicidal lamps were not in use and considerable contamination was found to have taken place, as shown in Table 1. Both instruments and plates were then subjected to the rays from the same ultraviolet lamps, placed 12 inches from the table, with remarkably interesting results. This experiment showed that contamination was reduced to zero in 20 minutes.

At the end of the first operation, 40 minutes after the start of the experiment, a number of doctors and nurses in sterile gowns, caps and masks gathered around to watch the progress of the experiment. No reinfection was indicated. But at the end of the second operation, a number of anesthetists, capped and masked, but wearing ordinary uniforms, surrounded the experimental work tables, as indicated by the dagger (†) at 55 minutes. Reinfection was then indicated, but once again this was overcome by the action of the germicidal lamps.

The result of these experiments appears

to demonstrate not only that sterile instruments contaminated by dust can be re-sterilized by exposure to germicidal lamps, but that sterile instruments can be maintained in a highly sterile condition, if protected by radiation from such lamps.

Attention was next directed to the possibility of sterilizing various solutions used at the close of operations, such as pilocarpine and atropine. From time to time, in various clinics, cases of postoperative endophthalmitis and panophthalmitis have been traced to this source. Two such tragedies having occurred in our clinic, a number of specimens of the suspected solutions were pooled and investigated. Pilocarpine (two percent) in 1/5,000 aqueous zephiran was found highly contaminated by proteus vulgaris, and atropine (one percent) in 1/20,000 bichloride of mercury by bacillus subtilis.

Samples from these solutions were placed in medicine glasses to the depth of one inch, and were then exposed to the action of the germicidal lamps. The distance of the lamps from the solutions, as in the case of the instruments and agar plates, was again one foot. The pilocarpine was sterile in 10 minutes, the atropine in seven minutes. These results were reported in the paper read at the 1952 meeting of the American Ophthalmological Society.

The facts presented are of much interest and of great significance. They open vistas suggesting many interesting possibilities for the future.

Could it be shown that containers are available which will not alter the pharmacological properties of those drugs in common use in ophthalmology, and which would permit their sterilization while encapsulated within them, and could it be shown further that sterilization by this method had no deleterious effect upon the action of these drugs, an immense field of usefulness for such methods would immediately become apparent.

It is well known that the dropper stopper bottle in such common use by the ophthalmic profession is a most excellent breeding place for contamination and cross-infection. Yet nothing but various preservatives, or complicated, time-consuming and expensive devices, have been suggested to obviate this difficulty.

With the co-operation of the Northwestern Bottle Company of Saint Louis, polyethylene vials have been obtained from the Plax Corporation, of Hartford, Connecticut, who have offered full assistance in any research along these lines. These tubes are so constructed that by gentle pressure on their sides the contents can be expressed drop by drop. They, therefore, may be considered as dropper bottles. Using these bottles, experiments have been carried out which I wish to report at this time.

The side walls of those droppers used were 22/1,000 inch thick, an important factor, since absorption of the ultraviolet rays by any material through which they pass is rapidly increased as the thickness of the substance increases. It is also well to bear in mind that the density increases slightly with each exposure, so that the same tubes should not be used indefinitely.

In the Chicago lecture previously mentioned, it was briefly reported that contaminated solutions in these polyethylene dropper bottles, with their caps on, could be sterilized by exposure to General Electric ultraviolet lamps at six inches, after a period of 60 minutes. Such a length of time was considered too great for practical purposes. Further experiments were, therefore, conducted upon contaminated solutions in the same containers at 12 inches, and later at 1.5 inches. The reports of these experiments follow:

An extremely heavy suspension, about 15,000,000 organisms per ml., of a culture of bacillus subtilis, containing a large percentage of spores, was used to fill the polyethylene droppers. The caps were left off. The filled capsules were placed under the germicidal lamps at a distance of 12 inches. At the times indicated, 0.1 ml. of the contents

of each dropper was expressed by gentle pressure and mixed with 9.9 ml. of sterile tryptase broth. The whole was shaken, and 1.0 ml. was dropped upon a sterile petri plate, after which molten agar was poured into the plates, mixed with the broth and allowed to harden.

After this, each plate was incubated for 24 hours, at 37°C. The colonies, representing the number of bacteria in 1/100 ml. of the dropper contents, were counted, and recorded as shown in Table 2.

Two droppers were used for exactitude; "A" was always replaced under the lamps in its original position, while "B" was turned over each time that a drop was expressed for analysis. In addition, in most instances plates were run in duplicate to insure accuracy.

From this experiment, it appeared obvious that it was not possible to sterilize such a highly concentrated solution in the containers used at a distance of 12 inches from the lamps, even with the caps removed. Since, however, the object of the experiment was to provide a method by which solutions to be used in the operated eye at the close of operation could be kept on hand and sterilized in their original containers during the course of the operation, it was a very simple step to repeat the above procedure at a distance of 1.5 inches.

In the next experiment, therefore, the same two polyethylene droppers were partially filled, one with 2.8 ml. of an aqueous solution of pilocarpine (two percent) and

TABLE 2

EXPOSURE TO ULTRAVIOLET LAMPS (G-15, T-8) AT 12 INCHES CAPS REMOVED

Minutes	Dropper A		Dropper B	
20	*	*	*	*
25	*	*	*	*
30	25,000	30,000	19,000	21,000
36	2,500	2,900	2,000	1,900
40	2,100	1,800	1,000	1,400
50	190	210	120	130
55	11	14	8	6
60	7	8	5	5
70	9	—	5	—
80	6	—	3	—

*=Overgrowth.

TABLE 3

IRRADIATION OF DRUGS IN CAPPED CONTAINERS BY ULTRAVIOLET LAMPS (G-15, T-8) (2537 A) AT 1.5 INCHES

Time in Minutes Under Lamps	Plates		Colonies	Organisms per ml. in Solution
5	Pilocarpine	1.0 ml. 1/100	400	40,000
		0.1 ml. 1/1	5,000	50,000
	Atropine	1.0 ml. 1/100	500	50,000
		0.1 ml. 1/1	5,000	50,000
8	Pilocarpine	1.0 ml. 1/100	200	20,000
		0.1 ml. 1/1	1,000	10,000
	Atropine	1.0 ml. 1/100	200	20,000
		0.1 ml. 1/1	2,000	20,000
10	Pilocarpine	1.0 ml. 1/100	0	0
		0.1 ml. 1/1	0	0
	Atropine	1.0 ml. 1/100	10	1,000
		0.1 ml. 1/1	30	300
12	Pilocarpine	1.0 ml. 1/1	0	0
		0.1 ml.	0	0
	Atropine	0.1 ml.	1	10
		0.1 ml.	0	0
13	Pilocarpine	1.0 ml.	0	0
		0.1 ml.	0	0
	Atropine	0.1 ml.	1	10
		0.1 ml.	1	10
14	Pilocarpine	1.0 ml.	0	0
		0.1 ml.	0	0
	Atropine	0.1 ml.	0	0
		0.1 ml.	0	0

15, 17, 19, 21, 24 and 30 minutes—no growth in any plate.
It will be seen that sterilization was complete in 14 minutes.

the other with a similar quantity of aqueous atropine (one percent). To this was added, in each vial, 0.2 ml. of a suspension of B. subtilis of a concentration such that there were 22,000,000 organisms in each 0.1 ml. of solution at the start of the experiment.

The two tubes, or droppers, with their caps on, were then placed upon tinfoil 1.5 inches under the two G-15, T-8 lamps, after which, at intervals (see table 3), 0.1 ml. of the contents of each dropper was expressed into sterile petri plates, mixed with molten agar, allowed to solidify and incubated at 37°C. for 48 hours. At the same time, additional plates were made, using 0.1 ml. portions of the dropper contents diluted 1/10, making a solution equivalent to 0.01 ml. of the original solution. At the end of the 48-hour incubation period, the colonies were counted, as shown in Table 3. After the first 10 minutes the 1/10 dilution plates were discontinued, and two plates of the 0.1 ml. dilution only were used.

It should be noted that the presence or absence of the caps from the tubes is a matter of considerable importance. In the practical use of the droppers, the tip of the dropper is that most likely to contamination from the lids and lashes, and when the cap is in place, sterilization of this portion of the dropper must be accomplished through the cap, the thickness of which is slightly greater than that of the dropper itself.

TABLE 4

IRRADIATION OF POLYETHYLENE DROPPERS ON SHELF ONE INCH UNDER ULTRAVIOLET LAMPS (G-15, T-8) (2537 A)

Minutes	Dropper with Cap	Dropper without Cap
5	*	*
10	*	*
15	7,000	4,800
20	8 (0.1 ml.)	2 (0.1 ml.)
	87 (1.0 ml.)	14 (1.0 ml.)
25	0 (0.1 ml.)	0 (0.1 ml.)
	0 (1.0 ml.)	0 (1.0 ml.)
30	0 (0.1 ml.)	0 (0.1 ml.)
	0 (1.0 ml.)	— (1.0 ml.)
35	0 (0.8 ml.)	0 (0.82 ml.)
		All that was left in droppers.

*=Overgrowth.

TABLE 5

IRRADIATION OF INSTRUMENTS BY ULTRAVIOLET LAMPS (G-15, T-8) AT 12 INCHES WITH SHELF FOR DROPPERS IN PLACE

Minutes	Colonies
5	2,000+
10	110−
15	0
20	1
25	0

In order to simulate exactly the conditions to be encountered in actual practice in the operating room, two further experiments were carried out.

An aluminum shelf, having many holes, was constructed, and fastened to the housing of the ultraviolet lamps so as to have its surface about one inch below the center of the lamps. At the same time, two aluminum wings were also attached to the lamp housing to shield personnel from the radiation.

A suspension of B. subtilis, containing 1,890,000,000 organisms to the milliliter in broth, was placed in two polyethylene droppers (4.5 ml. each) and the droppers placed on the shelf. One dropper had its cap in place, the other had the cap removed. At the indicated times, 0.1 ml. samples of the dropper contents were removed to sterile petri plates, mixed with molten agar, allowed to solidify, incubated for 48 hours, and the colonies counted, as shown. Then, after 15 minutes, 1.0 ml. portions were taken, as well as 0.1 ml. portions (table 4).

The second experiment (table 5) with the dropper shelf in place under the ultraviolet lamps, was carried out to determine whether the action of the lamps was interfered with to any extent by the presence of this shelf, 2.5 inches wide, between one end of the lamps and the instrument table.

From these experiments, it is apparent that, under such circumstances, sterilization of these drugs in highly contaminated aqueous solutions can be accomplished in from 15 to 25 minutes, while undisturbed in the containing vials, and that the shelf so con-

structed does not interfere with the process.

This having been found to be true, it remained to determine the effect of such radiation upon the pharmacologic activity of the drugs involved. In order to clarify this point, the solutions remaining in the droppers used in the third experiment were instilled, after 30 minutes' exposure to the ultraviolet lamps, into the eyes of rabbits, and the effect noted.

The pilocarpine was dropped into one eye of each of two rabbits, while the fellow eyes were left untreated and observed as controls. Well-marked contraction was noted in each eye treated in less than 10 minutes, while the untreated eyes were not affected. A similar procedure was followed with the remnants of the atropine solution. In these rabbits, dilatation took place in the treated eyes in just short of 15 minutes, while the control eyes remained unaffected.

Such results demonstrate, from clinical observation, that neither of the drugs tested loses its pharmacologic properties by radiation.

The tendency of certain drugs to resist radiation and to suffer change in their pharmacologic action, and, on the other hand, the probability that others may be sterilized without damage, can be determined to some extent by a consideration of certain basic characteristics.

Drugs derived from plant life, for instance, are likely to be good subjects for such treatment; others, such as fluorescein which becomes luminous under the action of the ultraviolet rays, are resistant to the passage of these rays. But that fluorescence does not entirely prevent sterilization was demonstrated by an experiment in which an old culture of B. pyocyaneous having 250,000 organisms to the ml., and enough pyocyanin to fluoresce well, was placed in a polyethylene dropper, and the dropper placed on the shelf under the ultraviolet lamps. At the indicated times, 1.0 ml. portions were removed, mixed with molten agar, incubated, and the colonies counted after 48 hours. The results are shown in Table 6.

TABLE 6

DEMONSTRATION THAT FLUORESCENCE DOES NOT ENTIRELY PREVENT STERILIZATION BY ULTRAVIOLET LAMPS (G-15, T-8) (2537 A)

Minutes	Colonies
15	±2,000 (1 ml.)
20	760 (1 ml.)
25	600 (1 ml.)
30	48 (1 ml.)
35	11 (0.6 ml.)

Changes in other drugs, the action of which is not so easily observed clinically, may be determined by alteration in their infrared spectrum, though clinical effectiveness must be the eventual criteria in each individual case. A wide field for investigation along such lines remains open for further studies.

Thus far, this report has dealt with aqueous solutions. The question arises as to what can be done toward sterilization of the many ointments used in ophthalmology and other medical sciences. In an effort to solve this problem, two commercial ointments in common use were investigated.

Terramycin ophthalmic ointment (Charles Pfizer & Co., New York) containing 5.0 mg. to the gm. and 0.5-percent atropine ophthalmic ointment (Abbott Laboratories, Chicago) were melted and each poured into a separate test tube. They were then heated to 105°C. for 15 minutes, to destroy some of their activity, which might of itself have eliminated the contaminating organisms.

Suffice it to say that even after 30 minutes there was very slight, if any, decrease in the number of colonies found in the specimens examined. From this observation, it would appear that the ordinary commercial ointments are not susceptible to sterilization by ultraviolet radiation of 2,537 angstrom units. It is probable, however, that ointment bases can be found which will permit the passage and germicidal action of these rays. Further studies are desirable.

Conclusions

Results achieved up to the present time, and those still remaining to be investigated, may be summarized as follows:

1. A satisfactory solution for the rapid sterilization of practically all types of surgical instruments has been found.

2. Methods for the reduction of dust-borne infection in ophthalmic and other types of surgery have been demonstrated. These may be placed under three general classifications, a, b, and c:

a. The removal from or sterilization of dust in the air of the operating room.

b. The removal of contaminating dust from the instruments at the moment of use in operation, by noninjurious germicidal solutions.

c. The maintenance of sterility of the instruments used in operation, while exposed on the table during the time of operation, by the use of ultraviolet radiation of 2,537 angstrom units.

3. A demonstration that certain drugs in solution can be sterilized in small polyethylene containers in a relatively short period of time.

4. That the pharmacologic reactions in these same drugs have not been destroyed by such sterilization.

5. It has been pointed out that consideration of these facts and application of the methods suggested may lead to a complete revolution in the present methods of maintaining drugs in a sterile condition during their frequent use and recurring contamination in office practice.

On the other hand, before such a complete change in technique can be adopted, it still remains to be shown just exactly what drugs, other than those thus far studied, can be treated in this manner, and what ones must be handled differently. Also, the problem of the ointment base must be solved before a satisfactory answer to the entire problem can be said to have been found. Such will be the line of further studies.

In closing I must once more acknowledge my great debt to the untiring enthusiasm and technical skill of Mr. William Moor, bacteriologist to the Department of Ophthalmology of Washington University, without whose assistance these studies could never have been attempted.

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Ophthalmic Miniature

We often see, indeed, people who, during their whole existence, are troubled with inflamed and running eyes; and it is not going too far to say, that the primary cause of these evils has been, in numberless instances, the pernicious custom of rubbing the eyes on first awaking.

H. Colburn,

The Art of Preserving the Sight Unimpaired to an Extreme Old Age, London, 1816.

BILATERAL EXTERNAL RECTUS PARALYSIS WITH BILATERAL MUSCLE TRANSPLANTATION*

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Although abducens paralysis is relatively common, bilateral abducens paralysis without involvement of nerves of other eye muscles is rather rare.[1] The most likely cause is bilateral basal skull fracture, the sixth nerve being injured where it courses over the tip of the petrous portion of the temporal bone.

Of the cases due to trauma, a number will clear spontaneously over a period of months.[2] If the paralysis is still present at the end of six months, surgical treatment is usually advisable.[3]

Some cases are improved to the point of binocular vision by multiple recessions and resections of the laterally acting muscles.[4] In many unilateral cases of sixth-nerve paralysis, this treatment produces satisfactory results, but a considerable number of cases, particularly bilateral ones, require more surgery.

Transplantation of portions of the tendons of the superior and inferior recti to the insertion of the paretic lateral rectus was first advocated by Hummelsheim.[5]

Gifford[6] reported two cases of bilateral abducens paralysis following skull fracture, which showed good results with this procedure. Green[7] and Lutman[8] each reported a case with a satisfactory result after a transplantation operation on only one of the eyes. One of the cases of Lyle and Cross[4] showed a similar result. Mangus[9] and Berens and Girard[10] have reported the application of this procedure to cases of congenital bilateral abducens paralysis.

A case of bilateral abducens paralysis, due to trauma, treated unsuccessfully with multiple recession and resection operations is presented. A bilateral muscle transplantation operation produced single vision and some lateral motion of each eye.

CASE REPORT

H. K. S., a 27-year-old white man, was injured in a motorcycle accident, April 4, 1948, and was unconscious for several hours after the accident. A period of mental confusion of one week followed the recovery of consciousness. Skull X-ray studies showed only a compound fracture of the mandible which was wired and healed uneventfully in two months.

Six days after the accident a marked esotropia was noted, with paralysis of the lateral recti bilaterally. The amount of esotropia was not recorded but was stated not to have diminished within the next nine months. Patching of the eyes with daily alternation was used to prevent diplopia. No other neurologic residual was noted.

On March 1, 1949, an eight to 10 mm. resection of each lateral rectus muscle was done. On April 19th, a five mm. recession of each medial rectus muscle was performed. On July 26th, six mm. more of the right lateral rectus were resected and a similar resection of the left lateral rectus followed on August 16, 1949. All operations were done with local anesthesia. There was still a residual esotropia of 18 to 20 degrees at the time of the patient's discharge in October, 1949.

The patient was first seen by me (in a service hospital) in March, 1951. At this time he had a vision of 6/5 in each eye. There was an esotropia of 40 prism diopters at 20 feet with the cover test and the patient was still using constant monocular occlusion with daily alternation of eyes, to avoid diplopia. There was no motion of either eye past the midline.

On April 25, 1951, a tendon transplanta-

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Fig. 1 (Riffenburgh). Postoperative eye motions.

tion was done on the left eye under sodium-pentothal anesthesia. The lateral rectus was removed from its insertion and the lateral halves of the superior and inferior recti were attached to this insertion. The atonic lateral rectus was reattached with a three mm. advancement. The postoperative course showed only moderate reaction.

Following this operation there was about 15 degrees of motion of the left eye laterally. Fusion was possible with the head tilted forward and looking in the extreme upward field of gaze. About 15 prism diopters of esotropia remained in the primary position.

On June 6, 1951, a similar procedure was done on the right eye with a good postoperative course. Following this, the right eye also had about 15 degrees of lateral motion. Fusion was present except when looking well to either side or in extreme downward gaze at very close objects. The patient was able to go without his monocular patch with comfort.

One year later the condition was essentially the same (fig. 1). Lateral gaze was done with motions of the head rather than the eyes and the patient noted no diplopia.

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THE TENDON-TRANSPLANTING OPERATION*

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The tendon-transplanting operation is a very interesting procedure in the surgery itself, as well as in the excellent results that may be obtained. It is especially effective in cases of sixth-nerve paralysis. Since this is the most common paralysis of the eye muscles, I should like to confine my remarks to this type of case, although the operation works well in other extraocular muscle paralyses. The purpose of this paper is solely to explain how and why tendon transplanting will effect a new action in the muscles involved (the superior and inferior recti in this paper as already mentioned).

In case anyone is not familiar with the Hummelsheim operation of tendon transplanting, may I state that it consists in transplanting the lateral halves of the tendons of the two vertical recti into the region of the insertion of the external rectus. By means of this the eye is able to turn out past the midline as much as 35 degrees, the amount depending upon various factors. Usually some recessing of the internal rectus is performed and resection of the paralyzed external rectus.

There are excellent papers on the technique of the operation and the many clinical factors involved, so I shall confine my subject merely to an understanding of the new abducting power imparted by the transplanting. Sometime back I had the opportunity to perform a procedure in the operating room that throws some light on the subject. This will be described later in the paper.

The most recent article on this subject is by Spaeth.[1] He believes that outward rotation is effected by the pull of the obliques. He says:

"The procedure reduces the amount of adduction by minimizing the adduction ability of the superior and inferior rectus muscles. This, plus the resection of the paretic external rectus muscle, holds the eye in the midline for the maximum abduction function of the two oblique muscles while working together. . . . The tendon transplants, brought toward the position of the advanced external rectus muscle, form a fanlike aponeurosis of the cicatrix holding the eye in the midline and permitting this abduction function of the oblique muscles. Certainly, the tendon transplants cannot act as abductors; they can function only as cicatricial adhesions."

This is very interesting and no doubt the obliques do exert some effort toward abduc-

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Fig. 1 (Hildreth). Side view of muscle attachment. X represents point of insertion and Y point of contact.

tion, but I believe this is minimal and not adequate to explain the results obtained with the tendon transplanting operation.

O'Connor[2] has written on this subject and, for the most part, makes the matter very clear. One paragraph from him leaves me with some lack of understanding. He says, in describing his operation in which he transplants the nasal portion of the tendon instead of the temporal part, "this operation, mechanically and physiologically, is far superior to transplantation of the outer halves because:

"1. All the new attachment is far external to the median vertical plane of the eye. This, of course, mechanically favors outward rotation. There is no opponent action by the outer portions as with the older method. When the outer halves are transplanted, the inner act not only as mechanical obstacles, but also as physiologic opponents. Moreover, it is entirely possible, as Woodruff claims, the point at which the tendon-split ends may adhere to the sclera and spoil the whole result by making that point actually the new insertion."

As to my own views, let us turn to Figure 1. X is the point of insertion of the tendon and Y the point of contact. When the muscle contracts, the rotating effect on the globe will be as though the tendon were fastened at Y (unless there is considerable rotation and point Y moves away from contact with the ball; for our purposes here, let us assume that rotation is minimal and point Y remains in contact with the globe).

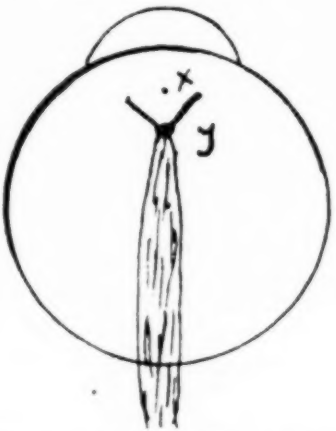


Fig. 3 (Hildreth). Point of contact Y is at same place as in Figure 2. The tendon has been split and the ends inserted apart.

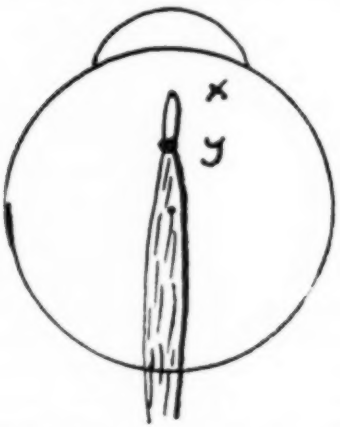
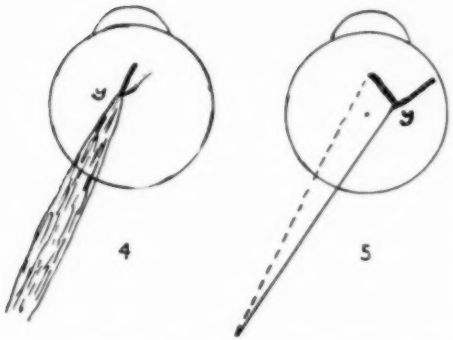


Fig. 2 (Hildreth). Vertical view of muscle attachment. X represents point of insertion and Y point of contact.

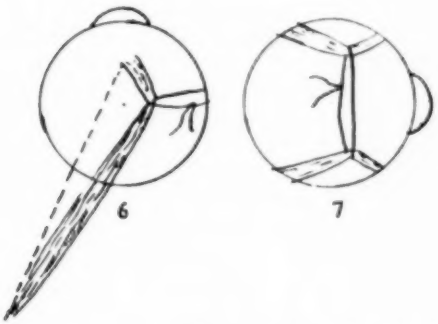
In the next illustration (fig. 2), we are looking down on a muscle. Again there is the insertion at X and the point of contact at Y.

In the third illustration (fig. 3), the tendon has been disconnected from the globe, split, and the two ends of the tendon sewed to the sclera in the new positions. This has been done in such a way that point Y is in exactly the same position as is shown in Figure 2. When the muscle acts on these two globes, the pull is on point Y and I think the action will be precisely the same in both these instances.



Figs. 4 and 5 (Hildreth). Vertical view of superior rectus. In Figure 4 the muscle lies normally on the nasal side of the vertical axis of rotation. In Figure 5 the tendon has been split and transplanted. The muscle now lies lateral to the vertical axis of rotation.

There is no contracting power in the tendon tissue; muscle action consists entirely in shortening the distance between the muscle origin and its point of contact with the globe. The short tendons shown in the illustrations correspond with the short tendons actually found in the superior and inferior recti (less than six mm.). In the operating room the tendons split easily to the muscle belly, but no further unless the surgeon divides the muscle with scissors. Sometimes one sees diagrams illustrating this operation with long tendons vaguely suggesting that the two tendon slips act independently, somewhat as new muscles.



Figs. 6 and 7 (Hildreth). Vertical and lateral views of globe showing loop of silk thread drawing the vertical recti lateralward.

In the fourth illustration (fig. 4), the superior rectus is shown coursing back to its origin. One sees here that the muscle lies nasal to the vertical axis of rotation.

The next picture (fig. 5) shows the result of transplanting the lateral portion of the tendon into the region of the insertion of the external rectus muscle. *Point Y has been displaced lateralward and now lies on the temporal side of the vertical axis.* This shifting lateralward of point Y explains how the adducting power of the vertical recti can be changed to abducting power. I believe this alone explains the action of the tendon transplanting operation.

To support this contention, I offer the following three lines of evidence:

1. A model was constructed as suggested by the illustrations. A rubber ball, one inch in diameter, was pinned to a board, the pin acting as the vertical axis of rotation. Threads were fastened to the ball to act as the two vertical recti. When drawn backward in the proper angle, the two threads would cause the ball to turn inward. The "tendons" were then split and transplanted as in the diagrams and now the threads would pull the ball outward.

2. As suggested by the diagrams, one might expect that outward rotation would take place if the entire tendon of the superior and inferior rectus muscles were transplanted lateralward. O'Connor has done this in a number of cases and reported good abduction. He discontinued the operation, however, because of vertical imbalances.

3. I should like to report an experience of my own. While operating on a young man under local anesthesia, I performed the following procedure. His case, by the way, was one of esotropia (nonparalytic).

The internal and external recti were completely disconnected from the globe so that there was almost no horizontal movement possible. The tendons of the superior and inferior recti were then exposed and a loop of silk thread passed around them, as indicated in the last two drawings. When the loop was

tightened, the tendons were displaced toward each other in the direction of the external rectus. This in effect amounted to a tendon transplanting.

The patient was now able to rotate the eye outward past the midline. The loop was tightened a little more and abducting power was further increased.

This new abducting power was imparted at once, of course. No training was required and no new nerve pathways were created. Such is the case also in the usual transplanting operation; that is, the new abduction is created at once and easily demonstrated at the first dressing.

The remainder of the operation just described has nothing to do with the subject under discussion. The silk loop was removed and the horizontal muscles sutured so as to correct the esotropia.

The original Hummelsheim operation utilized the outer halves of the two vertical recti for transplanting. Berens[3] increases abducting power by shifting the nasal half of the tendon to the site occupied by the outer half and then transplanting the outer half. O'Connor increases the abducting power by transplanting the nasal halves. Both these procedures displace point Y, the point of contact, more lateralward than in the original operation. This in turn explains why the abducting power has been increased.

As mentioned earlier, the operation is applicable to paralyses of the other extraocular muscles, but for simplicity of understanding I felt it better to confine the discussion to the one type of case.

Conclusion

Tendon transplanting displaces the point of contact the muscles make with the eyeball and as a consequence the direction of pull will be altered. In the case of a sixth-nerve paralysis, abducting power is imparted to the vertical recti by displacing the point of contact lateral to the vertical axis of rotation.

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Ophthalmic Miniature

Treatment of squint by means of a mask was a favorite system of the Arabian School of medical practitioners. Rhazes (850-923 or 933) was one of the earliest, Avicenna or Ibn Sina (979-1037), a famous Arab physician, gave the cause of squint as weakness of the muscles, or a spasm of the muscles, and he gave the mask as the cure. In later years the mask was the standard instrument for the cure of squint, or at least part of the treatment.

Albert Barnett, *The Optician*, July 30, 1948.

THE HYPERTENSIVE RESPONSE OF THE HUMAN EYE TO ANTERIOR CHAMBER PUNCTURE*

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Between 1918 and 1923 through systematic studies by Seidel,[1] Hagen,[2] Bonnefon and Magitot,[3] and Kahn and Loewenstein,[5] paracentesis of the anterior chamber became established as inducing a phase of distinct ocular hypertension in experimental animals. In man, a similar though less marked phase was first reported by Hagen[2] and Magitot.[4]

Studies of the response to paracentesis of the anterior chamber of human eyes in various clinical states by me[6-10] revealed that a fairly consistent difference in the magnitude of the hypertensive phase existed between glaucomatous and nonglaucomatous eyes. While in the beginning, the number of control eyes available for this purpose was very limited, the difference between their response and that of early glaucomatous eyes seemed definite enough to be of diagnostic value.

Opposition to the idea of using the paracentesis of the anterior chamber as a means of diagnosis was voiced by Abraham[11] on the grounds that the response to this procedure was dependent upon the function of the ciliary body which was related to other, specifically visual, functions of the eye. In some of my early control cases, Abraham suggested, the function of the ciliary body had been abnormally low because of amblyopia or optic atrophy.

Baratta[12] studied the late part of the hypertensive phase after paracentesis of the anterior chamber and found it more pronounced in glaucomatous than nonglaucomatous eyes.

In association with Dr. E. Grossman, Dr. H. I. McGarry, and Dr. H. E. Smith, I continued my studies and, in 1941, in a scientific exhibit at the American Academy of Ophthalmology and Otolaryngology, presented new evidence demonstrating a quantitative difference in the response to paracentesis of the anterior chamber between eyes affected with chronic open-angle glaucoma and nonglaucomatous human eyes. The material which formed the basis of this exhibit was considerably larger than any previously presented series of cases.

A larger number and greater variety of control eyes had become available, the study of which revealed that the response of the nonglaucomatous eye to the paracentesis of the anterior chamber varied within wider limits than had been realized originally. The magnitude of the hypertensive reaction was found to exceed very materially the limits stated in the early publications.[6, 7]

Besides, in the exhibit, a sharp distinction was made between acute, narrow-angle glaucoma, on the one hand, and chronic, open-angle glaucoma, on the other hand. The significance of this distinction had not been clearly realized by me prior to 1941.

During the last 12 years, Amsler and his associates made important contributions to the development of the paracentesis of the anterior chamber as a diagnostic clinical test. While their interest was focussed upon cytologic, immunologic, and bacteriologic properties of the aqueous in uveitis, some attention was paid to the variations of the ocular tension following paracentesis of the anterior chamber. The results were published by Strassmann[13] in his doctor's dissertation and summarized by Verrey[14] in a paper presented before the Swiss Ophthalmological Society in October, 1948. There Verrey stated: "In chronic noninflammatory glaucoma we are unable to confirm Kronfeld's view that the paracentesis of the anterior chamber is the best method of diagnosing glaucoma by means of the hypertension which follows the paracentesis of the anterior chamber."

While I admittedly in my younger years

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TABLE 1

EVIDENCE PRESENTED BY STRASSMANN

Case No.	Clinical Diagnosis	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
1	Malignant melanoma of choroid	19	0.20	0	3	20	28	33	32
2	Incipient senile cataract	22	0.10	0	7	31	32	33	30
3	Retinitis pigmentosa	24	0.10	0	15	26	35	45	42
4	Incipient senile cataract	25	0.10	0	10	41	43	45	44
5	Obstruction of upper temporal retinal artery	25	0.06	5	20	36	35	34	31
8	Incipient senile cataract	16	0.15	0	0	4	12	21	19
9	Incipient senile cataract	17	0.10	0	3	13	23	25	24
10	Complicated cataract	17	0.30	0	0	3	12	21	19
11	Incipient senile cataract	18	0.06	0	0	8	17	27	26
12	Neurosis	19	0.15	0	4	15	22	23	24
13	Incipient senile cataract	23	0.15	0	15	26	27	25	24
14	Nuclear cataract diabetic retinopathy	31	0.14	0	4	14	18	25	30 (36)
15	Obstruction central retinal vein	21	0.20	0	3	8	13	18	20
16	Retinitis pigmentosa	22	0.16	0	3	15	17	19	20
17	Incipient senile cataract	28	0.10	0	18	21	21	21	21

had a very high opinion of the diagnostic value of the paracentesis of the anterior chamber, I am not aware of ever having described it as the best method for the diagnosis of chronic glaucoma.*

Verrey's opinion was based on evidence presented in detail in Strassmann's dissertation and consisting essentially of recordings of the response to paracentesis of the anterior chamber of 15 nonglaucomatous and six glaucomatous eyes. Since these observations are not readily accessible to the American reader and have a definite bearing upon the principal question under discussion here, they are summarized in Tables 1 and 2.

These paracenteses of the anterior chamber were made under topical (cocaine) anesthesia with Amsler's lancet-shaped cannula. No attempt was made to empty the chamber completely, but the amount of fluid obtained was measured (V).

Tonometric readings were taken with Schiøtz tonometers immediately before (T_1) and after (T_0) the paracentesis of the anterior chamber. Further tonometric readings were taken 10, 30, 60, 120, 180, 240, and 360 minutes after the paracentesis of the anterior chamber. Of these the 30, 60, and 120 minute readings were recorded in tables as T_1, T_2, and T_4, respectively. T_3, 90 minutes after the paracentesis of the anterior chamber, and T_5, 150 minutes after the paracentesis of the anterior chamber, were obtained by interpolation.

One of the most recent opinions concerning the paracentesis of the anterior chamber is that of Sugar who in his monograph, *The Glaucomas*,[15] describes "the anterior chamber puncture test as an excellent test which is useful in investigation and rarely indicated in office practice," a view with which I now wholeheartedly agree.

For the last 10 years I have felt that the difference between the response to paracen-

* I did say: (1) The paracentesis of the anterior chamber is a very valuable diagnostic aid, but more investigations on a large material are necessary before we shall be able to make the diagnosis of the presence or absence of glaucoma from the result of the paracentesis of the anterior chamber (Ztschr. f. Augenh., **71**:61, 1930. (2) The paracentesis of the anterior chamber is a valuable provocative test which deserves a place among the various other procedures devised to diagnose early or latent primary simple glaucoma (Arch. Ophth., **9**:801, 1933). (3) The paracentesis of the anterior chamber is recommended as a safe and expedient provocative test for the detection of early or latent primary glaucoma. The practical usefulness of paracentesis of the anterior chamber we believe to be as great as that of the observation of diurnal variations of tension (With Lin, C. K., Chinese Med. J. **50**:1323, 1936). (4) In cases where you want to decide right away whether or not you are dealing with a glaucoma, I think puncture of the anterior chamber is a very useful test (Tr. Am. Ophth. Soc., **28**:152, 1930).

TABLE 2

EVIDENCE PRESENTED BY STRASSMANN

Case No.	Clinical Diagnosis and Findings	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
18	Chronic glaucoma for several years, tension between 20 and 35 mm. Hg under pilocarpine	21	0.06	4	18	26	29	32	34
19	Chronic glaucoma for many years, iridectomized 20 years before. Disc atrophic. Tension normal under pilocarpine	23	0.05	0	10	22	28	26	24
20	Chronic glaucoma for 2 years. Tension between 30 and 50 mm. Hg	31	0.10	0	20	36	40	42	43
21	Chronic glaucoma for 4 years. Tension between 25 and 45 mm. Hg	34	0.04	0	20	34	43	47	45
22	Almost absolute glaucoma. Tension between 50 and 70 mm. Hg	49	0.10	0	12	20	25	30	35
23	Acute glaucoma of several days' duration, under pilocarpine-eserine	53	0.08	0	4	18	24	31	35 (41, 47)

teses of the anterior chamber of the glaucomatous and the nonglaucomatous eye was only a matter of academic interest. Since the report of the Amsler school questioned the existence of such a difference and since the contents of our exhibit of 1941 have not appeared in print, I am reporting in the following that portion of the exhibit that concerned itself with the question of a difference between glaucomatous and nonglaucomatous eyes including some follow-up observations on both groups.

In all the cases reported herein the original work-up and the paracenteses of the anterior chamber were done before September 1, 1941. The punctures were performed under pontocaine anesthesia, with a 27-gauge needle on a tuberculin syringe, aspirating aqueous until the iris around the tip of the needle made contact with the posterior surface of the cornea.

THE MATERIAL

Using the criteria stated below the material was divided into controls and early glaucomas.

As controls for the purpose of this study (table 3) patients were used who met the requirements of (1) being over 40 years of age with refractive errors not exceeding $\pm$ 3.0 diopters, (2) being affected with diseases such as macula degeneration, inactive central choroiditis, partial optic atrophy, toxic or other forms of amblyopia, (3) hav-

TABLE 3

THE CONTROLS (Kronfeld)

Case No.	Initials, Race and Sex	Diagnosis	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5	T_6
1	P. S., w, m	Toxic amblyopia	22	0.32	0	0	10	20	30	33	33
2	A. S., c, f	Macula degeneration	20	0.17	0	0	14	26	32	30	30
3	M. B., w, f	Macula degeneration	24	0.25	0	0	30	42	42	42	42
4	M. A., w, m	Optic atrophy	19	0.27	0	6	15	23	28	26	28
5	C. D., w, m	Toxic amblyopia	23	0.20	0	5	15	30	26	26	24
6	D. di M., w, m	Toxic amblyopia	18	0.25	0	0	0	5	15	17	20
7	M. S., w, f	Amblyopia	17	0.19	0	0	0	16	16	16	17
8	A. B., c, f	Central choroiditis	17	0.32	0	0	0	10	30	34	41
9	B. W., c, m	Macula degeneration	25	0.26	0	0	10	20	35	40	38
10	A. G., w, f	Macula degeneration	25	0.18	0	0	12	32	35	38	41
11	M. K., w, f, right	Normal	21	0.21	0	0	17	38	31	28	28
12	G. T., c, m, left	Normal	23	0.20	0	10	10	28	43	35	32
13	A. S., w, f, right	Normal	21	0.31	0	0	23	28	40	40	—
	left	Normal	19	0.24	0	0	4	23	50	52	—

TABLE 4

EARLY GLAUCOMAS (Kronfeld)

Glaucoma Clinic No.	Diurnal Fluctuations (mm. Hg)	Highest Tensions Observed (mm. Hg)	H_2O Test	Paracentesis of Anterior Chamber								Follow-up		
				T_1	V	T_2	T_1	T_4	T_2	T_3	T_5	Length of Time	Tension Under Miotics (mm. Hg)	Optic-Nerve Disease
534 R†	25–28	35	29–35	30	0.19	0	18	50	68	55	50	8 years	up to 35	slowly progr.
L*														
493 R	19–23	28	24–32	23	0.17	0	26	40	50	57	55	2 years	33	station
L	20–30	35	24–31	23	0.22	0	21	50	50	56	50		28	station
789 R†	21–28	32	26–26	24	0.21	0	7	24	49	46	46	6 years	37	progr.
L†	21–25	30	23–28	23	0.21	0	6	21	40	40	46		32	progr.
436 R	24–28	30	25–26	23	0.22	0	10	18	28	60	67	2 years	32	station
L	26–30	28	25–26	30	0.19	0	10	30	43	60	77		32	station
496 R	23–30	32	30–35	30	0.22	0	35	40	65	65	52	11 years	35	progr.
L	24–28	32	30–35	23	0.27	0	8	21	46	60	60		35‡	progr.

* Operated upon for cataract prior to this study.
† Early glaucomatous disc and field changes.
‡ Operated upon for glaucoma during the follow-up period.

ing stable ocular tension as evidenced by diurnal fluctuations of less than 5.0 mm. Hg and a normal response to the water-drinking and mydriatic test, and of (4) not showing any findings suggestive of chronic, open-angle glaucoma during a minimum period of observation of one year.

Included among the controls are three patients in whom the subjective complaints or the findings at the first examination in the clinic suggested the possibility of glaucoma which, however, was not confirmed by a specific glaucoma work-up and by a period of observation of 11, 9, and 3 years respectively. On the basis of this observation these three cases are listed as normal although in the last patient's left eye the tension was recorded as having risen to 50 and 52 mm. Hg after the paracentesis of the anterior chamber.

The cases designated here as early glaucomas (table 4) were characterized by abnormalities of the ocular tension evidenced either by repeated tonometric reading above 27 mm. Hg Schiøtz, and/or marked diurnal variations and/or at least a positive response to the water-drinking test. These abnormalities were present in at least one eye.

In three of the nine eyes listed in Table 4, very early disc and field changes of the glaucomatous type were noted. In the remaining six cases, the ophthalmoscopic appearance of the nervehead and the central fields were within normal limits. Elevation of the ocular tension above 27 mm. Hg remained a characteristic feature of all cases in this group even under the influence of miotics.

In the three cases that remained under observation for six or more years from the time of their initial study in the glaucoma clinic (including the paracentesis of the anterior chamber), the glaucomatous optic-nerve disease proved to be progressive. A glaucomatous excavation with a corresponding field defect could be seen to develop in the right eye of Case 496. In Cases 534 and 789 the initial field defects increased in size and density. The diagnosis of early, open-angle glaucoma seemed, therefore, justified in all cases listed in Table 4.

DISCUSSION

The control cases listed in Table 3 show striking variations in their response to the paracentesis of the anterior chamber. The lower extreme is represented by Cases 6 and 7 which showed hardly any hypertensive phase. In six eyes the hypertensive phase was pronounced, reaching peaks well above 40 mm. Hg. The upper extreme is represented by the left eye of Case 13 which reached tensions above 50 mm. Hg. The nonglaucomatous nature of this last eye was

borne out by a follow-up period of 11 years.

The variations recorded in Table 3 are essentially the same as those found by Strassmann and Verrey despite the difference in technique. The incomplete emptying of the anterior chamber as practiced by the latter author is conducive to a more rapid rise of the ocular tension to a slightly lower peak (Kronfeld and Lin[10]).

Taking this factor in consideration, the two control series are even more similar than they appear at first glance. This similarity is gratifying and reassuring and, partly at least, makes up for the fact that the factors determining the magnitude of the hypertensive phase are still largely unknown. That lack of knowledge is to some extent, due to avoidance of obviously extreme variants which was the principle underlying the selection of the controls. Nevertheless the control series do not appear homogeneous.

Strassmann indicated that by placing his Cases 15, 16, and 17 in a separate group which he called "eyes with slight reaction." Unfortunately, some of my early control cases were of that type, as recognized and rightly stressed by Abraham.[11]

That the slight reaction of these eyes is real and not due to fistulation, is demonstrated by a high degree of test-retest consistency. The conclusion must be drawn that there are eyes with characteristically slight reaction to paracentesis of the anterior chamber and that such eyes should be kept out of control series intended to serve as a standard with which to compare the glaucomatous eye.

From the data published thus far it appears that the hypertensive reaction is related to the initial ocular tension and to the patient's age. Advanced senile cataract seems to have a depressing effect upon the hypertensive reaction. Since slight degrees of senile cataract are very common in patients with so-called primary open-angle glaucoma, such very early degrees of cataract should be represented in the control series.

At the present stage of our knowledge, control series such as Strassmann's and mine are probably valid if one eliminates from it all eyes with slight reaction or with anterior segment pathology revealed by the paracentesis of the anterior chamber. Then one arrives at series with the highest hypertensive peaks around 45 mm. Hg, except for the one eye of my Case 13.

In the case of a female control patient it appears now that one would have to avoid the phase of menstrual depression of the facility of outflow first reported by Shahan, Jr.[16] Needless to say, the importance of this point was not known at the time the paracentesis of the anterior chamber was performed on Case 13. A possible clinical significance of Shahan's finding is suggested by the sex ratio of 4:1 in favor of the women among the group of cases registered in the glaucoma clinic of the Illinois Eye and Ear Infirmary on the suspicion of glaucoma which was disproved by specific investigation and observation.

Be that as it may, it appears that hypertensive phases up to 52 mm. Hg may occur in nonglaucomatous human eyes and that Table 3, minus Cases 6 and 7, probably represents a valid control series, with means and standard errors as shown in Table 5.

It was the purpose of this and previous studies by me to investigate the difference between the glaucomatous and the nonglaucomatous eye. To make such comparison

TABLE 5

THE RESPONSE TO PARACENTESIS OF THE ANTERIOR CHAMBER OF THE CONTROL AND THE EARLY GLAUCOMA GROUPS, EXPRESSED AS MEANS WITH THEIR STANDARD ERRORS

	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
Controls	21.6 ± 0.73	0.244 ± 0.015	0	0.92 ± 0.61	13.3 ± 0.23	26.7 ± 2.50	35.1 ± 2.10	35.3 ± 2.20
Early glaucomas	25.4 ± 1.20	0.210 ± 0.009	0	15.7 ± 3.40	32.7 ± 4.22	48.8 ± 4.06	55.4 ± 2.60	55.9 ± 3.60

TABLE 6

REPEATED PARACENTESES OF THE ANTERIOR CHAMBER (Kronfeld)

Initials, Race, Sex, Diagnosis	Eye	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
S. F., c, m.	R	24	0.21	0	0	5	21	40	48
Vascular optic	R	24	0.23	0	8	18	28	40	46
atrophy	L	23	0.22	0	0	10	26	37	35
	L	23	0.21	0	6	14	36	40	40
M. A., w, m.	R	23	0.27	0	6	15	23	28	26
Syphilitic optic	R	23	0.26	0	0	11	17	21	30
atrophy	R	16	0.26	0	0	6	14	23	29
	R	14	0.29	0	0	4	10	24	26
M. K., w, f.	R	21	0.21	0	0	17	38	31	28
Normal	R	21	0.24	0	10	27	33	38	37
E. N., w, f.	L	20	0.18	0	6	13	35	38	35
Normal	L	18	0.17	0	18	30	43	43	43
M. A., w, f.	L	26	0.22	0	15	19	25	25	21
Normal	L	23	0.25	0	0	16	21	28	28

valid and fair, the glaucomatous eye had to be definite as to type, early with regard to elevation of ocular tension and optic nerve disease, and genuine that is unoperated and not under the influence of miotics. The patients listed in Table 4 meet these requirements, plus the requirement of persistence of the elevation of ocular tension for a period of several years after the initial work-up.

In Strassmann's small series of glaucomas only the patients in Cases 20 and 21 met the above requirements. If the paracenteses of the anterior chamber in these cases had been complete, the peaks would probably have been higher than those observed. The remaining four cases of the Strassmann series are unsuited for comparison with nonglaucomatous eyes, Cases 18 and 19 because they apparently were under pilocarpine at the time of the very incomplete paracentesis of the anterior chamber, Case 22 because it was far advanced with an initial tension of 49 mm. Hg, and Case 23 because it was of the acute type with an initial tension of 53 mm. Hg.

A comparison of the means of my series (table 5) reveals that from what at first glance seems like a similar initial tension level, the paracentesis of the anterior chamber causes in the glaucomatous as well as in the nonglaucomatous eyes a drop to a level below the tonometric range. The restoration of the ocular tension to the original level is decidedly faster and the hypertensive phase more pronounced in the glaucomatous than in the nonglaucomatous eye.

Statistical methods also reveal a significant difference between the means of the initial tensions which, at first glance, may seem surprising.

The mean initial tension of the nonglaucomatous eye is 21.6 mm. Hg which is slightly but significantly lower than 25.4 mm. Hg, the mean of T_1 of the early glaucomas. While that may seem like a very small difference, it should be realized that it is a difference between means and not single tonometric readings. There are many clinical observations suggestive of a narrow but definite margin between early glaucomatous and nonglaucomatous eyes.

The response to the paracentesis of the anterior chamber is much more strikingly different in the two groups than the initial tension. The means for T_1, T_2, T_3, T_4, and T_5 are significantly higher in the glaucomatous than in the nonglaucomatous eye. The hypertensive phase of one glaucoma patient (Case 789) remained within the limits de-

TABLE 7

REPEATED PARACENTESES OF THE ANTERIOR CHAMBER (Kronfeld)

Clinic No., Eye, Date	Early Glaucomas							
	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
493 R 12-21-39	23	0.15	0	29	48	55	56	55
R 2- 6-41	23	0.17	0	26	40	50	57	55
496 R 1-16-40	30	0.22	0	35	40	65	65	52
R 11-25-40	30	0.21	0	12	30	37	67	72
789 R 4-25-40	24	0.21	0	7	24	49	46	46
R 11-19-40	30	0.25	0	4	18	35	46	50
436 R 4- 1-40	26	0.18	0	10	21	38	50	50
R 11-27-40	23	0.22	0	10	18	28	60	67

scribed for control eyes and suggests some overlapping between glaucomatous and non-glaucomatous eyes, which is what one would expect on the basis of general biologic considerations.

The concept of the response to the paracentesis of the anterior chamber being a characteristic feature of the eye under consideration is supported by the high degree of test-retest consistency shown in Tables 6 and 7. To what types of eyes, other than controls and early glaucomas, this concept applies is not definitely known at this point.

The response of early narrow-angle glaucoma between attacks is shown in Table 8. A conspicuous feature is the residual tension after complete emptying of the anterior chamber. The chamber-contents in most of these cases constitute such a small portion of the volume of the whole globe that aspiration of this small portion cannot be expected to lower the ocular tension to below the tonometric level. Whether the hypertensive phase of the narrow-angle glaucomatous eye, which, in absolute terms, is only moderate and well within the range of the control eyes, is in any way characteristic is difficult to say since control eyes, strictly speaking, do not exist. In most eyes with similarly shallow chambers a combination of several angle-crowding factors produces a decided rise of tension. The fact that a few cases of acute attacks following paracentesis of the anterior chamber have been reported in early narrow-angle glaucomas should, probably, be interpreted as a sign of the general lability of such eyes and not as a specific response to the paracentesis of the anterior chamber.

Studies of the mechanism of the hypertensive phase after paracentesis of the anterior chamber in nonglaucomatous eyes now in progress in this department may be expected to throw further light on the problem of regulation of the intraocular pressure.

TABLE 8

NARROW-ANGLE GLAUCOMAS (Kronfeld)

Clinic No., Race, Sex, Eye, Date	T_1	V	T_0	T_1	T_2	T_3	T_4	T_5
637, w, f. R 5- 2-40	21	0.12	0	5	30	25	23	20
L 5- 9-40	24	0.11	3	28	26	26	25	25
L 11-19-40	23	0.05	5	18	27	26	26	26
47029 (PUMC) Ch, m.	20	0.06	5	16	23	32	26	22
52284 (PUMC) Ch, f.	22	0.08	6	23	32	25	25	25
53271 (PUMC) Ch, f.	28	0.11	7	21	38	36	20	25

Summary

A significant difference in the response to anterior chamber puncture was found to exist between eyes affected with early chronic, open-angle glaucoma and nonglaucomatous control eyes. The results of earlier studies were thus confirmed.

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VARIATIONS IN NORMAL HUMAN CORNEAL ENDOTHELIUM*

A PRELIMINARY REPORT OF PATHOLOGIC HUMAN CORNEAL ENDOTHELIUM

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It has long been known that the normal endothelium acts to prevent excessive hydration of the cornea, and that when this layer is sufficiently damaged the stroma and epithelium become edematous. If this increased hydration persists for a long enough time, the typical biomicroscopic, microscopic, and, finally, gross changes in the cornea that have come to be associated with bullous keratitis and its sequelae ensue.

In the routine laboratory examination of such cases, we have been impressed with the microscopic changes in the endothelium. Invariably the nuclei are flattened, attenuated and reduced in number. Indeed, such changes are seen in corneas reported to be edematous biomicroscopically, but in which there is little evidence of edema in the fixed specimen.

The clinical behavior of such eyes may closely resemble, if not duplicate, that seen in primary endothelial dystrophy; yet it is our feeling that the endothelial changes are often secondary to varied ocular pathologic processes, such as inflammation, glaucoma, hypotony, and senescence. These changes, associated with a diminished capacity of the endothelium, may be borderline, and therefore may be present in corneas which are clinically clear. Further insult, however, by disease or injury may result in abnormal corneal hydration.

For example, it is not extremely unusual for persistent corneal edema to develop after otherwise uncomplicated cataract extraction in glaucomatous patients, and it is more likely to occur if there has been previous glaucoma surgery. It happens, although the intraocular pressure remains normal or possibly subnormal. It is not uncommon for corneal edema to persist after surgery for glaucoma secondary to iridocyclitis, although the tension is normalized and there is minimal evidence of active uveitis.

Because the endothelium consists of a single layer of cells and is therefore difficult to evaluate in cross section, it was suggested that we study flat sections. In so doing, it became apparent that there was considerable variation in the endothelium of supposedly normal eyes, and it became necessary to study a series of such eyes in an attempt to establish normal criteria. This paper primarily has to do with that study. In addition, however, we have included preparations of five abnormal eyes which present an interesting contrast to the normal and serve as a preliminary report of future investigation.

We made flat preparations of the cornea of normal eyes from 64 patients. Two of these proved to be abnormal and will be discussed separately. The eyes had been removed at autopsy, fixed in formalin, em-

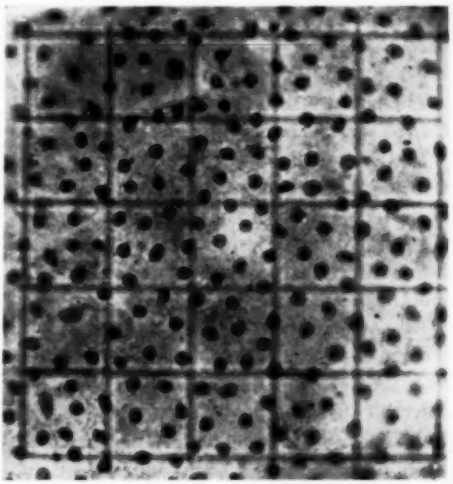

Fig. 1 (Irvine and Irvine). Case 11-49. Age, 50 years. Normal endothelium. Normal grid-field of 25 such fields counted, giving a mean cell count of 105 cells per field.

* From the Estelle Doheny Eye Foundation.

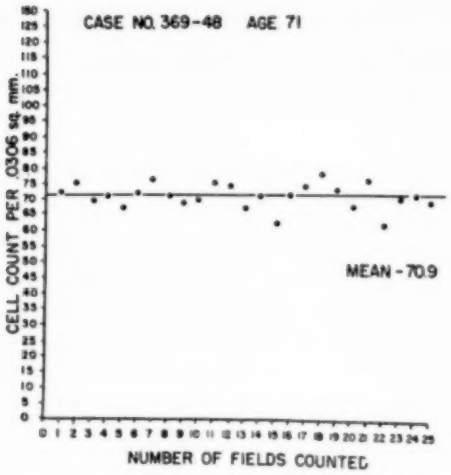

Chart 1 (Irvine and Irvine). Scattergram, showing concentration of endothelial cells in a normal cornea.

bedded in celloidin, sectioned, and their cross sections studied.

The celloidin was dissolved from the uncut central portion of the block by emersion in ether and absolute alcohol. The cornea was then excised and hydrated to 80-percent alcohol. The epithelium and as much of the stroma as possible were shaved off with a Bard-Parker blade and the remaining button was mounted with the endothelial surface uppermost. The specimen was then stained with hematoxylin.

The endothelial nuclei stained well in all instances and in some cases the cell borders were well defined. The remaining stromal cells were comparatively few in number and did not interfere with visualization of the endothelium.

An ocular micrometer was calibrated with a stage micrometer and it was found that, with the 10-power ocular and the 40-power objective, the ocular micrometer represented a grid 0.175 mm. squared. This grid was finely divided into 25 equal squares.

The endothelial cells within a grid-field were counted in a manner similar to that used in the counting of blood cells. In counting the cells of a single square, only those touching two borders were included with those lying within the borders as representing the cells within that square.

Twenty-five such grid-fields were picked at random and counted for each specimen, there being no attempt to differentiate between the center and the periphery of the cornea. The only limiting factor in random picking was the presence of artefact, such as folds and small tears in the tissue. Figure 1 represents a photograph of a typical field viewed through the grid in the ocular.

The 25 counts in each eye were then plotted on a graph in the form of a scattergram. Chart 1 is an example of such a graph. Statistical analysis of the data indicated that the mean cell count in each case was indicative of the concentration of endothelial cells in the cornea.

The mean cell counts of 64 eyes were then arranged in a table according to age. This table (table 1) includes the laboratory number of the specimen, the age of the patient, the primary cause of death determined at autopsy, and the mean cell count of the flat preparation.

The data from Table 1 were then plotted on a graph and the confidence intervals for individual mean cell counts determined. This

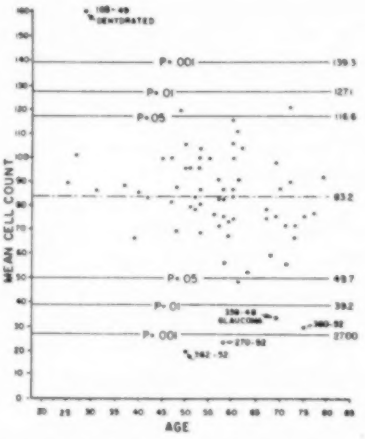

Chart 2 (Irvine and Irvine). Confidence intervals for individual eye mean cell counts, showing probability of normal eye counts falling outside of specified intervals.

TABLE 1

SUMMARY OF DATA CONCERNING 62 NORMAL EYES

Case No.	Age (years)	Autopsy Diagnosis	Mean Cell Count
266-48	25	Acute lymphoblastic leukemia	89
346-48	27	Metastatic synovioma	101
103-49	29	Lupus erythematosus	160*
319-48	31	Lymphosarcoma	86
418-48	37	Tuberculosis	88
268-48	39	Anaplastic seminoma	66
267-48	40	Anaplastic seminoma	85
299-48	42	Hypertension	83
284-48	47	Bronchial cell carcinoma	99
413-48	47	Pulmonary insufficiency	81
283-48	48	Carcinoma of lung	87
342-48	48	Hodgkins disease	74
420-48	49	Hypertensive heart disease	119
11-49	50	Carcinoma of sigmoid	105
341-48	50	Hepatic cirrhosis	95
412-48	51	Pulmonary tuberculosis	95
388-48	51	Periportal cirrhosis	79
264-48	52	Cerebral arteriosclerosis	78
324-48	52	Bronchial cell carcinoma	83
385-48	53	Reticulum cell carcinoma	99
287-48	53	Arteriosclerosis	103
318-48	53	Bronchial cell carcinoma	95
15-49	53	Carcinoma of tongue	68
270-48	53	Heart failure—Syphilis	86
269-48	53	Tuberculosis	80
265-48	55	Pyelonephritis—Uremia	99
9-49	56	Cerebral hemorrhage	76
273-48	57	Carcinoma of liver	82
367-48	57	Sarcoma of mediastinum	90
370-48	57	Adenocarcinoma of thyroid	71
327-48	58	Bronchopneumonia	56
300-48	58	Pulmonary tuberculosis	75
364-48	58	Fibrosarcoma of bladder	82
365-48	58	Bronchial cell carcinoma	86
381-48	59	Generalized arteriosclerosis	67
291-48	59	Adenocarcinoma of rectum	73
343-48	60	Carcinoma of esophagus	99
292-48	60	Hodgkins disease	83
298-48	60	Metastatic carcinoma	115
383-48	60	Uremia	86
384-48	60	Tertiary syphilis—Carcinoma of pharynx	105
417-48	60	Osteogenic sarcoma	74
306-48	61	Bronchial cell carcinoma	110
286-48	61	Hypernephroma	90
380-48	61	Bronchopneumonia	48
323-48	62	Pneumonia	103
344-48	63	Rheumatic heart disease	52
382-48	67	Carcinoma of tongue	74
386-48	67	Rheumatic heart disease	78
371-48	68	Bronchial cell carcinoma	59
99-49	69	Urethral abscess	97
363-48	69	Uremia	75
338-48	69	Coronary occlusion	33*
285-48	70	Arteriosclerosis	86
271-48	71	Generalized arteriosclerosis	45
369-48	71	Arteriosclerotic hypertensive heart disease	71
321-48	72	Arteriosclerosis	89
10-49	72	Generalized arteriosclerosis	120
414-48	73	Lymphatic leukemia	71
101-49	73	Coronary arteriosclerosis	66
368-48	75	Cerebral arteriosclerosis	75
345-48	77	Arteriosclerosis	76
302-48	79	Arteriosclerosis	91
297-48	84	Carcinoma of prostate	38

* 103-49 and 338-48 were found to be abnormal.

graph, listed as Chart 2, shows the probability of the average cell count of individual normal eyes falling outside given limits. For instance there are five chances in a hundred of the mean cell count in a specific eye falling outside the limits 49.7 and 116.6 cells per grid field. There is one chance in a hundred that any particular normal eye will have an average cell count greater than 127.1 or less than 39.2. Stated another way, 95 percent of the average cell counts of all normal eyes fall between the limits 49.7 and 116.6 cells per grid-field. Similarly 99 percent fall between 39.2 and 127.1 cells per field.

Confidence intervals for true mean cell count of all normal eyes were then calculated. They are shown on Chart 3. This graph indicates the confidence which can be placed in the grand mean of the 62 individual cell count averages (83.2). This grand mean is an estimate of the true mean of all the normal eyes in existence. The graph indicates the probabilities that this "true universe mean" falls within specified limits.

For instance, there are 95 chances out of a hundred (a 95-percent probability) that the true universal mean lies between 78.9 and 87.4. There is a 99-percent probability that it lies between 77.6 and 88.8, and a 99.9-percent chance that the true mean lies between 76.0 and 90.3.

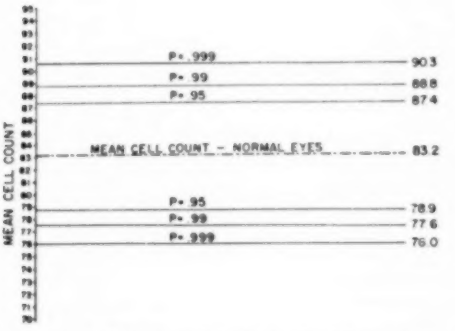

Chart 3 (Irvine and Irvine). Confidence intervals for true mean cell count of all normal eyes, showing probabilities that mean lies within specified intervals.

The data were analyzed to determine the effect of age on the individual mean cell count. There were too few eyes from individuals over 70 years of age to determine accurately whether a decrease in cell count exists as a change in senescence in that age group as one might expect from clinical experience.

It may or may not be significant that the lowest mean cell count in the series occurred in an individual 83 years of age. In this instance the average cell count was 38 cells per grid field. A review of the autopsy protocol and celloidin sections indicated that the eye was essentially normal, there being no indication of corneal edema. From the data one can say that there is little, if any, effect of age on endothelial cell concentration between the ages of 25 and 70 years.

It was noted that the eyes had been in formalin from four and a half to nine months prior to the time they were embedded. Statistical analysis revealed that there was no significant difference in cell count attributable to difference in fixation time.

It is possible that a slight effect of age or fixation time was obscured by some other unknown but extremely significant influence. That this influence exists is indicated by the fact that, although there is comparatively little spread between individual cell counts in any particular eye, there is a great spread between the mean cell counts of the eyes as a group. Although it is impossible to determine the nature of this effect from the available data, it is interesting to speculate upon the possible role of dehydration at the time of death on the mean cell count.

Chart 2 indicates one specimen (103-49) in which the mean cell count was abnormally high (160 cells per grid-field). This eye was from a 29-year-old man who had disseminated lupus erythematosis and who, at the time of death, was extremely dehydrated.

A review of the autopsy diagnoses suggests that many of these patients may have been variably and severely dehydrated at the

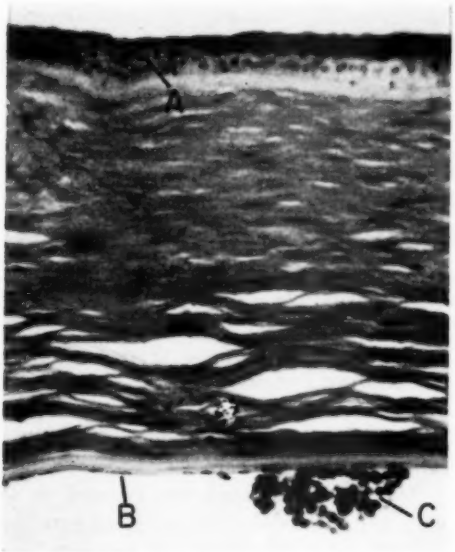

Fig. 2A (Irvine and Irvine). Case 270-52. Age 58 years. Cross section of edematous cornea, showing flattening and attenuation of endothelium. (A) Edematous epithelium. (B) Endothelium. (C) Pigmented keratic precipitate.

time of death. It may be that had we studied eyes having normal anterior segments and enucleated during life, that there would be no such wide variation in endothelial cell concentration among normal individuals.

After tabulating the data on the 64 normal eyes, it became apparent that two specimens were well outside the limits of the others. One presented an abnormally high concentration of the cells (103-49) we have just discussed. The other case (338-48) had a mean cell count of 34 cells per grid-field—considerably lower than the rest of the group. A review of the autopsy protocol and examination of the cross-section revealed that a gross error had been made and that this patient had been afflicted with glaucoma in the eye in question, and therefore the eye should never have been classified as normal.

Cross-sections of the remaining 62 normal eyes were then reviewed and no significant pathologic findings were noted. It appears significant to us that two supposedly normal eyes could first be detected as abnormal because of their unusual endothelial cell concentration.

Three abnormal cases (380-52, 270-52, and 362-52) were prepared and their mean cell count per grid-field plotted on Chart 2 to illustrate their difference from the normal specimens.

The first, 380-52, was the eye of a 75-year-old man who had had a penetrating wound of the ciliary body two months prior to enucleation. He had developed a hypermature cataract and secondary glaucoma. The eye was thought to be blind, and was enucleated because of pain.

There was no pathologic evidence of glaucoma. The chamber angles were open, the optic nerve was neither pathologically cupped nor atrophied, and ganglion cells were plentiful. There was little evidence of corneal edema; however, the endothelium was flattened, attenuated, and reduced in its number of cells.

The case was purposely chosen because of borderline abnormality. Clinically, the cornea was reported to have been edematous. The mean cell count per grid field in the

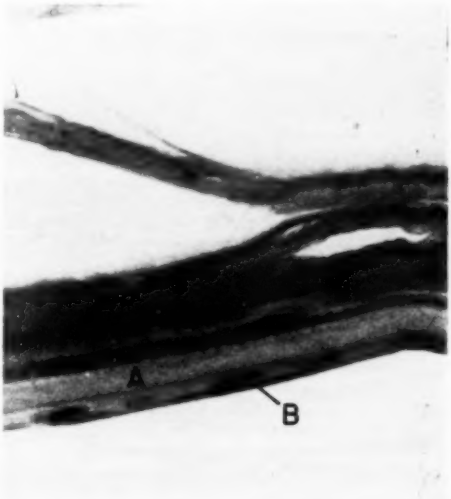

Fig. 2B (Irvine and Irvine). Case 270-52. High-power view of endothelium. (A) Descemet's membrane. (B) Endothelium.

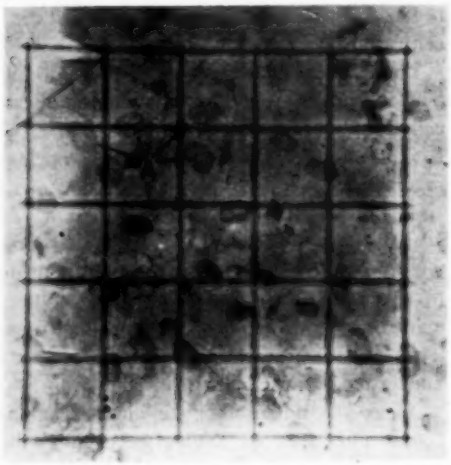

Fig. 3 (Irvine and Irvine). Case 270-52. Flat section of endothelium, showing greatly reduced concentration of cells per grid-field. (A) Endothelial cells.

flat section is seen to be 39 cells per grid field.

Case 270-52 represents the eye from a 58-year-old white woman who developed iridocyclitis and secondary glaucoma following the removal of a hypermature cataract by the extracapsular technique. The inflammation, thought to be caused by retained lens material, subsided after that substance had been irrigated from the eye. The intraocular pressure remained elevated but was normalized after iridectomy. The eye remained slightly inflamed and the cornea remained edematous. Because of the appearance of inflammatory cells in the aqueous of the opposite eye, the first eye was enucleated.

Histologically there was little evidence of glaucoma. The posterior segment was essentially normal. The cornea showed evidence of abnormal hydration and the endothelium appeared to be flattened and attenuated. Figures 2 and 3 represent a cross-section and a flat section of this cornea.

The mean cell count was reduced to 23 cells per grid-field. This case suggests the possible effect of severe and prolonged inflammation on a comparatively young and healthy endothelium.

Case 362-52 represents an eye from a 50-year-old man having chronic deep-angle glaucoma. The vision was nil, the optic nerve

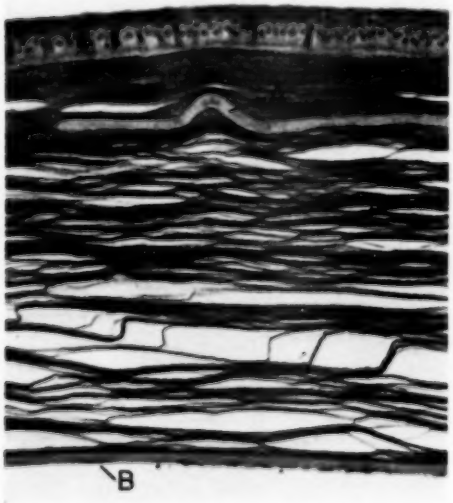

Fig. 4A (Irvine and Irvine). Case 362-52. Age 50 years. Chronic glaucoma and bullous keratitis. (A) Bowman's membrane. (B) Endothelium.

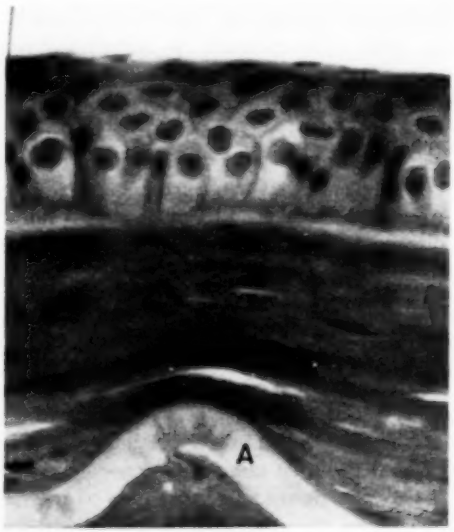

Fig. 4B (Irvine and Irvine). Case 362-52. Corneal edema. Epithelium separated from Bowman's membrane by connective tissue. (A) Bowman's membrane.

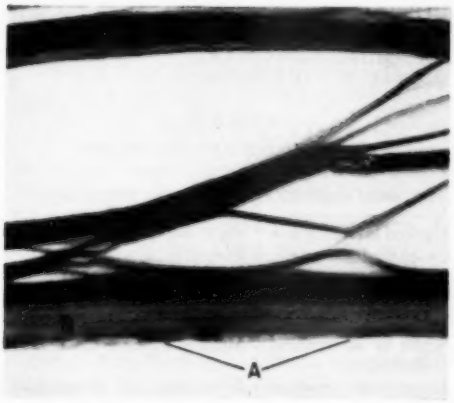

Fig. 4C (Irvine and Irvine). Case 362-52. Flattened and attenuated endothelium. (A) Endothelial cells. (B) Descemet's membrane.

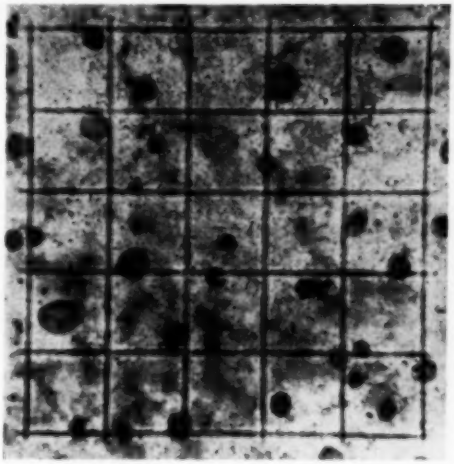

Fig. 5 (Irvine and Irvine). Case 362-52. Flat section of endothelium. Mean cell count equals 19 cells per grid-field.

was deeply cupped and atrophied, the nerve-fiber layer was thinned and gliosed, and ganglion cells were not apparent. Long standing bullous keratitis had been present.

Figure 4 represents a cross-section of this cornea and reveals the pathognomonic signs of bullous keratitis. Figure 5 represents a flat section of this cornea. The mean cell count is reduced to 19 cells per grid-field.

It was noted that as the endothelial cell concentration became abnormally low, the cells became pleomorphic, varying considerably in their size and shape, and in their distance from one another. As this effect became more pronounced, the cells of the stroma increased, so that scarring, which had been inconspicuous in cross-section, became vary apparent in flat section. Studies of these abnormal cases are in progress and will be reported later.

Summary

Flat sections of the cornea of 62 normal, formalin-fixed, celloidin-embedded eyes were prepared and the concentration of endothelial cells determined. Statistical analysis indicated the estimated concentration to be valid in each specimen. There was no significant effect of either age or difference in duration of fixation. There was great difference, however, between individual normal eyes irrespective of their age.

Five abnormal eyes were studied. One presented an abnormally high concentration of cells, possibly attributable to extreme dehydration preceding death. The remaining four had abnormally low concentrations of endothelial cells. These low counts are thought to represent changes in the endothelium occurring secondarily to a variety of intraocular pathologic processes and are thought to interfere with the normal endothelial function of preventing corneal hydration.

Microphotographs of typical examples of normal and abnormal eyes are included.

2010 Wilshire Boulevard.

We are grateful to Mrs. Jean Mannagh for her technical assistance in preparing the material studied. We are indebted to Mr. William B. Thompson and Mr. George W. Summers of the Prudential Insurance Company of America for their statistical analysis of the data.

MALIGNANT EXOPHTHALMOS*

ALSON E. BRALEY, M.D.
Iowa City, Iowa

Every ophthalmologist, thyroid surgeon, internist, and physiologist has been confused and surprised by the progress of patients with thyroid dysfunction. I will use the term "malignant exophthalmos" in preference to many other expressions, since it is to designate the progressive proptosis which increases to an alarming extent. The individual patient who develops an exophthalmos presents a problem for team work in medicine. The physician who carefully reads the current literature becomes so confused that he is apt to try every proposed treatment on his patient. He may, however, try the treatment that is least likely to be effective. I shall try to present clinical diagnostic aids so that the individual patient may be approached with positive treatment.

In order to treat the patient who has exophthalmos, one must have a working theory to understand the mechanism of the disease. Exophthalmos is caused by an excess of fluid or tissue in the orbit, forcing the eye outward. Stimulation of the cervical sympathetic ganglion will produce a widening of the palpebral fissure. If this is associated with a relaxation of the extraocular muscles, there is produced an exophthalmos.[1,2] This type of exophthalmos is soft and compressible, and almost always reversible. It is not associated with swelling.

At present a wealth of sound experimental and clinical evidence is accumulated to show that a substance arising in the anterior pituitary gland produces the exophthalmos.[3-7] From all the material presented, I believe with Thomas[7] and others that there are two types of endocrine exophthalmos. The first is due to stimulation of the cervical sympathetic ganglion and the second to oversecretion of the anterior pituitary.

In Graves' disease both types of exophthalmos may be present (table 1):

TABLE 1

TYPES OF MALIGNANT EXOPHTHALMOS

PRIMARY THYROID	PRIMARY PITUITARY
Marked lid retraction	Slight lid retraction
Exophthalmos soft	Exophthalmos firm or hard
No edema of conjunctiva	Edema of lids and conjunctiva
Slight or no tearing	Tearing marked
Slight or no reading disability	Marked reading disability
Intraocular pressure low	Elevation of intraocular pressure in various positions
Muscle weakness slight	Marked muscle paresis
No hyperemia	Venous congestion
Lids and face pale	Lids and face flushed
Marked evidence of hyperthyroidism	Normal thyroid function

The first is a primary hypertrophy and hyperplasia of the thyroid gland with all the classical general signs. The ocular signs are entirely due to sympathetic stimulation. The ocular findings are also classical, but I would like to add that the intraocular pressure is usually soft and there is no edema of the bulbar conjunctiva. The decrease of the thyroid secretion by any method will produce a cure of the disease. The thyroid secretion may be bound by giving small amounts of Lugol's solution by mouth.

This disease is most common in children and young people. The ophthalmologist is rarely called upon to see these patients, but he should be familiar with the eye findings.

In the adult, the best example of the primary thyroid hyperplasia is the so-called toxic adenoma. I have been unable to find any reports in the literature that a toxic adenoma has produced a severe exophthalmos. All of the sympathetic signs may be present.

Distinct from the sympathetic type of exophthalmos is the primary pituitary exophthalmos. The true primary pituitary ex-

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ophthalmos is not associated with any evidence of hyperthyroidism.

This is best exemplified by the following case:

CASE 1 (fig. 1)

N. T., a 63-year-old man, developed edema of the lids and feeling of pressure behind his eyes. The proptosis gradually increased, as did the edema, and his vision began to fail. The edema was of the upper and lower lids and of the bulbar conjunctiva. The proptosis measured 29 mm. in each eye; there was marked limitation in upward gaze and some limitation in ocular motility in all directions.

The intraocular pressure measured 80 mm. Hg (Schiøtz) in one eye and 60 mm. Hg in the other eye in the primary position. When the pressure was measured in slight downward gaze, it was reduced to 60 and 40 mm. Hg, respectively. Papilledema was present and the vision was reduced to 6/30 and 6/15, respectively.

All tests of thyroid function showed him to be euthyroid. He was given desiccated thyroid gland by mouth, four grains a day.

The exophthalmos decreased during the next two months to 24 mm. in each eye and the intraocular pressure reduced to 19 mm. Hg in each eye. The papilledema disappeared and the vision returned to normal. Rotations were still limited, the edema was still slight, and the tearing and burning of the eyes persisted.

Fig. 1 (Braley). *Case 1.* The pure pituitary exophthalmos.

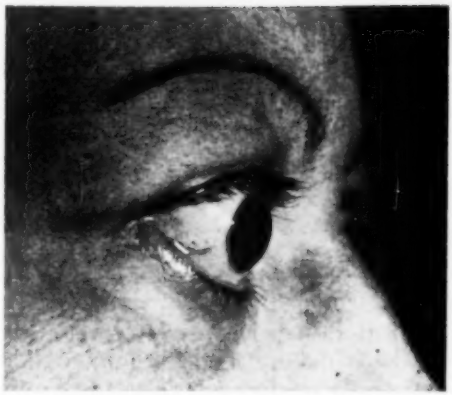

Fig. 2 (Braley). *Case 2.* The exophthalmos associated with primary thyroid dysfunction (hyperthyroidism).

This case illustrates the pure pituitary exophthalmos without any response by the thyroid to the probable secretion of the thyrotropic hormone by the pituitary. These primary pituitary euthyroid exophthalmos cases may develop rapidly, as previously described,[8] or slowly. If they begin slowly, the thyroid is more likely to respond by hyperplasia. The response of the thyroid to pituitary thyrotropic hormone is well known both experimentally and clinically.[4-9] Therefore, the majority of patients with primary pituitary exophthalmos will show some evidence of thyroid disturbance.

In order to illustrate the exophthalmos associated with primary thyroid dysfunction (hyperthyroidism), the following case is cited:

CASE 2 (figs. 2 and 3)

M. L., a white woman, aged 33 years, was seen because of staring of the eyes. She had been nervous and easily excited for a few weeks before the eye changes developed. She had excessive sweating, palpitations, sleeplessness, and nervousness.

All the eye findings were similar to that produced by stimulation of the cervical sympathetic ganglion. The exophthalmos measured 24 mm. in each eye. There was no edema of the bulbar conjunctiva. The orbits

Fig. 3 (Braley). *Case 2.* This staring disappeared after treatment with radioactive iodine.

Fig. 5 (Braley). *Case 4.* Malignant exophthalmos developed after thyroidectomy.

felt soft when the finger was placed between the lower rim of the orbit and the eye. The intraocular pressure was 15 to 18 mm. Hg in nearly all directions of gaze.

A diagnosis of hyperthyroidism was made and the patient treated with radioactive iodine. Following this treatment all signs of staring disappeared although the exophthalmic measurements remained the same.

The most difficult cases for all physicians may be illustrated by the following:

Case 3 (fig. 4)

M. B., a 50-year-old woman, has been followed since early in 1950. She began with mild signs of hyperthyroidism. She was placed on Propylthiouracil. One month later she developed edema of the bulbar conjunctiva and swelling of the lower lids. Proptosis and ocular palsy developed. She was hospitalized and all medication stopped.

The proptosis increased so much in spite of the hyperthyroidism that she was placed on one grain of thyroid daily. This was combined with small amounts of Lugol's solution, as reported previously.[8] She was controlled and the edema disappeared. Administration of thyroid was stopped, but the Lugol's solution was continued. As the edema of the lids disappeared, the iodine was gradually withdrawn.

Early signs of cardiac enlargement were evidenced, which was controlled by Lugol's and small amounts of methylthiouracil.

When the edema of the lids and the congestion began to recede, a subtotal thyroidectomy was done. She has been completely controlled with small amounts of thyroid since that time. The intraocular pressure was not elevated above 25 mm. Hg in either eye in any direction of gaze.

The following case illustrates the extreme care necessary to prevent the development of malignant exophthalmos.

Case 4 (figs. 5 and 6)

C. G., aged 40 years, was first seen because of excessive nervousness, excitability, palpi-

Fig. 4 (Braley). *Case 3.* The most difficult type of case for all physicians.

Fig. 6 (Braley). *Case 4.* The patient developed a corneal ulcer in the left eye.

tation, and exophthalmos. She had all the signs of Graves' disease, but in addition she had marked chemosis of the bulbar conjunctiva. This was associated with development of myopia and a variation in the intraocular pressure. Before treatment could be started she transferred to another clinic where a thyroidectomy was done.

After the thyroidectomy all nervousness disappeared, but the edema of the bulbar conjunctiva increased and a malignant exophthalmos developed. Before thyroid and iodine could be given, she developed a corneal ulcer in the left eye. Lid adhesion was attempted followed by a lateral canthoplasty in both eyes. On desiccated thyroid gland therapy, four grains a day, the edema began to disappear.

Comment

Dobyns[10] recently has presented evidence that there is a difference between the exophthalmos of Graves' disease and malignant exophthalmos. The exophthalmos is doubtlessly produced by a secretion from the pituitary gland. This seems to be combined with the thyrotropic hormone.

Since the exophthalmos should be controlled by decreasing this secretion, Beierwaltes[12] combined thyroid therapy with X-ray treatment of the pituitary gland. Good results were obtained in seven of 10 patients. He claims the irradiation of the pituitary produced a marked recession of the exophthalmos.

This work was confirmed by Hermann[13] who also used surgical removal of a portion of the pituitary tissue. This had previously been reported by Dobyns,[10] using electrocauterization of the pituitary gland. From these clinical experiences, I feel that there is little doubt that a substance produced by the pituitary gland is responsible for malignant exophthalmos.

Diagnosis

The diagnosis of pituitary exophthalmos, when there is no associated hyperthyroidism, is usually rather simple. However, in the past two years I have seen four cases that went undiagnosed and untreated for from a few months to two years. Permanent irreversible changes are produced in the orbit, extraocular muscles, and in the eye while waiting for a diagnosis. One patient underwent an exenteration of one orbit, with the diagnosis of pseudotumor, before proper treatment was started and the second eye saved.

TABLE 2

Findings in malignant exophthalmos

I. Primary thyroid hyperactivity
A. Toxic adenoma (removal cured)
Sympathetic stimulation but no exophthalmos
No stimulation of pituitary
B. Hypertrophy and hyperplasia
Sympathetic stimulation
Pituitary gland stimulated with exophthalmos (Graves' disease)
II. Primary pituitary hyperactivity
A. Exophthalmos without thyroid hyperplasia
B. Exophthalmos with thyroid hyperplasia
Stimuli to the thyroid comes from the pituitary thyrotropic hormone

The most important findings are presented in Table 2.

The hyperemic edema of the bulbar conjunctiva is most striking. I think this accounts for the tearing and the marked burning sensation in the conjunctiva. The slight flush around the eyelids, brows, and forehead are also noteworthy. Increases in refractive myopia are sometimes present.

I believe one of the most consistent findings is demonstrated by the tonometer. When the intraocular pressure is measured in the resting position of the eyes, the pressure may be high normal or moderately elevated (25 to 35 mm. Hg [Schiøtz]). This resting position is frequently from five to 10 degrees below the perpendicular. When the pressure is measured in the semireclining position and the eyes looking upward 10 to 15 degrees above the perpendicular, the tonometer readings increase 10 to 30 mm. Hg. In one patient the pressure difference between 10 degrees below perpendicular to 15 degrees above perpendicular varied from 35 to 80

mm. Hg. I have the patient lower his head over the end of the table in order to get the eyes in a resting position before measuring the base or resting ocular pressure.

When the patient tries to look upward, a mass frequently develops on the lower lid that feels like the junction of the inferior rectus and the inferior oblique. Since the histology shows a marked round-cell infiltration and fibrosis of the extraocular muscles, I feel that the apparent palsy of various muscles as reported by Woods[11] is in reality due to inelasticity of the opposing muscle. While this is not a new concept, I believe it has not been sufficiently emphasized.

Treatment

Obviously these cases present most difficult therapeutic problems. Since the thyroid appears to have a depressing action on the pituitary,[3-6, 8] hyperthyroidism in the individual may be part of the syndrome. If no hyperthyroidism is exhibited, then the patient should be given thyroid gland substances in large enough amounts to suppress the pituitary. I feel that the patient should be started on at least two grains per day and gradually increased over a period of a week to four grains per day. The increase in dosage depends on the patient's cardiovascular system.

Generally, by the time the exophthalmos begins to recede and the edema to disappear (in from two to three weeks), a dosage of between four and five grains per day will have been reached. The intraocular pressure will normalize and miotics can be discontinued. Vision will usually improve and the amount of thyroid given may be gradually decreased. I find that lateral canthoplasty is the best procedure to protect the cornea.

Cortone or ACTH might be considered good therapy. However, from my own experience and from some of the reports in the literature, either may produce grave results. Similarly, X-ray therapy to the orbit should be used with caution because of the grave ocular results, including loss of the cornea.

I feel sure that some type of therapy should be directed to the pituitary gland, but since I am dependent upon either the X-ray Department or the Neurosurgical Department to carry out this therapy, I have been unable to so treat these patients. When malignant exophthalmos develops after thyroidectomy, then the ophthalmologist should do lateral canthoplasties and urge immediate X-ray therapy, surgery, or electrocauterization of the anterior pituitary gland.

University Hospitals.

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SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 10, 1953

DR. J. B. STANFORD, *presiding*

RETROLENTAL FIBROPLASIA WITH CATARACT EXTRACTION

DR. J. WESLEY MCKINNEY reported the case of Miss I. L. B., aged 30 years, who was first seen on December 16, 1950. She stated that her vision had always been very poor. For the past eight to 10 years the vision in the left eye had become dim, gradually growing worse; the vision in the right eye has been growing worse for about five years. She also stated that her eyes have always danced. Her past history was negative except for childhood diseases. She was a seven-month premature infant, her birth weight being two pounds. She did not know of any illness that her mother might have had during pregnancy. The family history was negative.

Examination. There was an oscillating nystagmus. The corneas measured nine mm. in each eye.

In the right eye the tension was normal and the pupil dilated well, revealing a dense opacity of the lens below the lower pupillary margin and general opacity of the lens above. There was a faint fundus reflex above but no fundus details could be made out.

In the left eye the tension was very soft, the pupil was totally occluded, and there were many visible blood vessels on the iris and old pigment deposits on the endothelium of the cornea.

Vision was: R.E., 2/200, with a −2.0D. sph. ⊂ −2.5D. cyl. ax. 150° = 3/200; L.E., light perception only.

General physical examination was normal in every way.

On January 5, 1951, a cataract extraction was performed on the right eye. A small iridectomy was carried out, and the lens was removed in capsule. The postoperative course was uneventful.

When the media had cleared, large, white, elevated scars could be seen in the entire periphery of the retina. There were extensions of the scars into the vitreous in the lower half and in the upper temporal quadrant of the periphery.

In the extreme periphery there could be seen many large pigment plaques. In the central vitreous there were two veil-like opacities stretching from scarred periphery to scarred periphery. In the posterior of the two opacities fine straight and taut fibers could be seen with the slitlamp. The posterior retina seemed normal although the blood vessels were attenuated. The discs appeared normal, though the margins were a little fuzzy.

On May 21, 1951, five and one-half months after the cataract extraction, the vision in the right eye with glasses was 20/200 and J1, held closely. Visual fields showed general contraction.

SARCOIDOSIS TREATED WITH CORTISONE

DR. OSCAR DAHLENE presented a 69-year-old Negress who was first seen in the John Gaston-Gailor Clinic in January, 1952, complaining that her eyes were red and sore, and her vision blurred. Vision was 20/50, O.U. Treatment with zinc-sulfate drops alleviated the condition. She was seen again in July, 1952, with the same complaint of burning and irritation, and again treated with zinc-sulfate drops.

On October 1, 1952, she returned with new complaints. The symptoms reported were those of headache, aching of the left eye, episodes of redness and severe aching of the left eye lasting all night, with blurring

of vision, and gradual clearing of the vision as the pain and redness receded. The eyes were white at that time. Tension was: R.E., 13 mm. Hg (Schiøtz); L.E., 25 mm. Hg. A water-drinking test was performed, and the maximum rise in pressure was to: R.E., 13 mm. Hg; L.E., 32 mm. Hg. The patient was placed on pilocarpine (two percent) for the left eye, and the tension seemed to respond.

On October 31, 1952, she returned with an acute attack of iritis, showing greasy keratic precipitates on the cornea, thick flare, and lardaceous yellowish-white nodules of the iris, and an oval, fixed pupil. Vision was: R.E., 20/50; L.E., 20/200; and tension: R.E., 13 mm. Hg; L.E., 44 mm. Hg. This time she was placed on atropine and hot compresses, and in three days showed much improvement, with tension falling to: R.E., 13 mm. Hg; L.E., 20 mm. Hg.

The usual rundown of possible causes of iritis was begun. Serologic test for syphilis was negative, chest X-ray films showed only some calcification of the aorta, and minimal fibrosis of the hilar region, X-ray films of the hands and wrists showed slight arthritic changes essentially normal for her age; skull films were normal. A toxoplasma test was run on the blood and reported positive in a dilution of 1:256 which is not significant in an elderly person of this area. Frei test was negative, as were the test for brucellosis, agglutinations for typhoid, proteus OX-19, tularemia, and undulant fever. No lesions were seen in the fundus of either eye.

On January 30, 1953, she was admitted for further studies. Electrocardiograms and physical examination revealed a mild cardiac decompensation which was treated appropriately. Lumbar puncture was done, and the spinal-fluid studies were normal. Serum calcium, alkaline phosphatase and inorganic phosphorus, serum chlorides, and Bromsulfalein tests were also within normal limits. Cephalin flocculation was 3+, but prothrombin time was essentially normal. The liver was punched twice to obtain tissue for biopsy, and this showed only normal tissue. A lymph node was found to be normal also. Skin from some old degenerated and pigmented areas on the legs was taken, and showed chronic granulomatous inflammation of the skin with giant cell formation, consistent with sarcoidosis.

On February 12, 1953, it was noted that there were synechias of the right iris and, upon examination with the biomicroscope, there were seen Koeppe nodules on the margin involved in these synechias, and pigmented keratic precipitates. She was given local cortisone drops (1:4) and atropine for both eyes. The redness of the eyes subsided rapidly, and the tension was: R.E., 20 mm. Hg; L.E., 17 mm. Hg.

The medical seminar discussed the case, and the consensus was that the cause of the iritis is most likely sarcoidosis. Systemic therapy with cortisone was advised, and on February 17th, a dosage of 100 mg. daily intramuscularly was established. By February 19th, the keratic precipitates were crenating and the ciliary injection was almost gone. On February 23rd and 24th, the nodules of the iris were seen to be small, and now have vanished except for a small white streak on the nasal iris of the left eye. The dense posterior synechias remain. Tension is normal.

In summary, the findings supporting the diagnosis of sarcoidosis are the eye picture, anemia, low white blood count with elevation of basophils and eosinophils, A/G ratio reversal, and hyperglobulinemia, negative purified protein derivative; and the skin biopsy.

Carcinoma at the Limbus

Dr. J. B. Cross presented a 70-year-old white man, first seen in the eye clinic of the Memphis Eye, Ear, Nose, and Throat Hospital, on September 15, 1952. At this time he complained of a spot in the left eye at the temporal limbal area which had been enlarging over the past year. He stated he had lost the vision in the right eye following

measles as a child. Past history also revealed treatment for squamous cell cancer of neck.

On examination, the right eye was found to have an old central choroiditis scar. At the temporal limbus area of the left eye, a mass of piled up white tissue, supplied by large blood vessels, was seen. The following week the mass was widely excised as a biopsy.

The pathologist returned a microscopic diagnosis of carcinoma in situ and stated the lesion was adequately removed and should be observed for recurrence. If such recurrence should be observed, the area would be treated with X rays. The patient has been seen at one-month intervals, and no recurrence has been seen to date, February 16, 1953.

Minute intraocular foreign body

Dr. Philip Meriwether Lewis reported a case of a very small foreign body, in order to point out the value of bone-free roentgenograms.

J. B., a white man, aged 23 years, came in on November 19, 1952, with a history of being struck in the eye with something just one hour previously, while striking on a chisel with a hammer.

Examination showed a wound two mm. long through the conjunctiva of the right eye in the 3-o'clock meridian, four mm. back of the limbus. There was a small amount of blood in the anterior chamber so that the aqueous was turbid; vision was reduced to 20/100; the fundus could not be seen. No wound could be found in the sclera.

The patient was referred to Dr. Anthony and Dr. Fisher for X-ray studies. Numerous pictures were made, all of which were completely negative except those made in such a manner as to avoid the surrounding bones. On each of these bone-free plates a very small foreign body could be seen in the anterior portion of the eye.

At operation, no wound could be found in the sclera. A two-mm. incision was made meridionally through the sclera in the 3-o'clock meridian, starting four mm. from the limbus. Application of the Lancaster magnet and also the giant magnet produced no response.

After several enlargements of the incision, plus an L-shaped extension, a slight protrusion of the uvea could be seen when the magnet was applied directly in the scleral wound. It was impossible to draw the object through. Therefore, an incision was made through the pars plana with a von Graefe knife. Reapplication of the magnet drew out the steel. It measured 1.0 by 0.4 by 0.1 mm. There was a considerable loss of vitreous.

The sclera was closed with 6-0 chromic catgut, as was the conjunctiva. Both eyes were bandaged for five days, after which pinhole glasses were worn for two weeks. Atropine was used daily. Penicillin and sulfonamides were administered daily for the first five days after operation. Convalescence was uneventful. The vision and fields were both normal.

Comment: A minute foreign body in an eye may be undiagnosed until siderosis develops unless great care is taken and unusual ability is shown by the roentgenologist. This case clearly illustrates the great value of bone-free films.

Daniel F. Fisher,
Recorder for Eye Section.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

October 6, 1952

Dr. Abraham L. Kornzweig, *president*

Scientific session

Slitlamp diagnosis of corneal and scleral disease

Dr. Milton L. Berliner said that first one must consider the nature of the tissues of the cornea and sclera. Both consist of collagenous fibers in a ground substance—the cornea transparent and the sclera opaque.

The property of transparency depends upon the nature of component proteins and upon dehydration; the transparent tissues of the cornea and lens and vitreous have a high mucoprotein content, whose inherent quality is transparency.

This transparency depends also on the amount of water in the tissues. In order for the cornea to remain clear, it must be dehydrated. This is a fundamental difference between the cornea and sclera. The sclera is dehydrated to its maximum when opaque; if the sclera is dehydrated artificially, it becomes transparent.

The dehydrating mechanism of the cornea is protected by the two membranes that surface the stroma, the epithelium and endothelium. The intact epithelium and endothelium act as semipermeable membranes, and, as such, are permeable to water but not to electrolytes or nonlipid soluble nonelectrolytes.

The fluid of tear film and the aqueous are hypertonic to the stroma (whose fluid is derived from the limbal blood vessels). This sets up a favorable osmotic gradient which keeps the cornea in a deturgescent state and hence clear. The sclera does not have such a mechanism and hence is opaque.

The precorneal film layer is divided into three parts: (1) The fixed layer or the layer of aminopolysaccharides. (2) The second layer is the liquid or lacrimal layer formed by the lacrimal gland, which has a high protein content. Its function is to lower the superficial tension and allow the epithelium to be properly moistened. (3) The lipid layer is a product of the secretions of the meibomian gland. This layer forms an emulsion which prevents evaporation of the liquid layer and also prevents its overflow. These three layers are under hormonal control.

Discussion. Dr. Rose asked Dr. Berliner if he knew of any work on antimetabolites in corneal and scleral disease.

Dr. Berliner replied that there have been several articles written recently on antimetabolites, but none that he knew referred specifically to the cornea or sclera.

President's address—Development of the fibrous tunic of the eye

Dr. Abraham L. Kornzweig mentioned several concepts associated with the development of the human eye. These are the anterior vitreous and the intercellular protoplasmic filaments.

The two theories associated with the development of the cornea and anterior chamber were discussed, and the arguments in favor of each theory was given. A new concept of a fixed point in the angle of the anterior chamber was advanced. This led to a discussion of the supportive function of the cornea.

The cornea is a dome-shaped structure with firm fixed abutments at its base. From these fixed abutments, a diaphragm consisting of the lens, iris, ciliary body, and zonular fibers has its attachment through the medium of the scleral spur.

The corneoscleral junction was discussed and the differences in appearance and function, as compared with the cornea and sclera proper, were enumerated. Also the time of appearance of the junction in embryologic life was determined by measuring the radii of curvature of cornea and sclera.

A brief discussion of the scleral development emphasized the time of development of the posterior part of the sclera, and the possible relationship to the onset of high myopia.

Finally a chart showing the dimensions of the embryonic eye at the different stages in development was shown.

Superficial corneal lesions

Dr. Ralph I. Lloyd said that he would consider the two most frequent and important conditions characterized by lowered corneal sensitivity, surface edema and lowered vitality—Fuchs's dystrophy and the sequella of dendritic keratitis.

Fuchs described the disease bearing his name as a superficial keratitis but we now know that the immediate but not the ultimate cause is a posterior endothelial dystrophy.

The corneal endothelium is different from any other tissue of its type. It can reproduce a Descemet's membrane even on the iris in the vicinity of the chamber angle. If for any reason this layer is defective, the aqueous seeps into the stroma of the cornea and affects its vitality as shown by corneal edema, loss of sensation, and depreciated vitality. Vogt, the Friedenwalds (father and son), and Verhoeff have shown that the slitlamp picture known as cornea guttata is the antecedent of the full-blown picture, but fortunately many cases remain quiescent.

An injury or cataract operation can change the condition limited to the posterior corneal surface into a serious disease imperiling the eye or, in more favorable cases, reducing the vision. If the condition is once established, there seems to be no possibility of control but, recognized early, if the cornea is protected from exposure to the effects of air and dust, a return to satisfactory vision is possible.

In addition to cornea ulceration, or nature's attempt to cure by formation of new tissue under the epithelium, an insidious form of glaucoma must be watched for. There is no reason to believe that the glaucoma causes the breakdown of the endothelium or the reverse, so it is put down as an abiotrophy or premature senility. The surface edema, anesthesia, and tendency to formation of blisters, which may become serious ulcers, are not to be confused with a similar aspect limited to the superficial parts of the cornea following dendritic keratitis.

Dendritic keratitis is often easily controlled but we may miss the loss of sensation afterward with which lowered vitality is inevitably associated. As long as the cornea is anesthesic, it cannot withstand exposure to wind and dust.

After an attack of dendritic keratitis, the cornea never again regains its normal vitality, and too early exposure, after what is supposed to be recovery, may soon be followed by disciform keratitis which if treated early may make a good recovery. Other cases may go along very well for some time and later suffer recurring ulcers each of which adds to the previous corneal scarring.

Several cases of this type known to have had dendritic keratitis as long as 20 years before, with several ulcers in the interim, were shown and also a type without reliable history with lowered sensation, epithelial plaques, and lowered acuity treated by lamellar keratectomy with surprisingly satisfactory results.

Discussion. Dr. Richard C. Troutman said that Dr. Lloyd had asked him to discuss several aspects of the surgical treatment of dystrophic types of corneal disease. He cited the case of Mr. G. P., who was seen first on September 13, 1952. A diagnosis of bullous keratitis with additional complications of two large white plaques in the cornea was made. It was decided that a total superficial lamellar keratectomy would be the procedure of choice since the depth of the lesion did not indicate that the surgeon would have to penetrate beyond one half the thickness of the cornea.

The anterior one third to one half of the corneal stroma was removed together with the epithelium and what remained of Bowman's membrane. A pressure dressing was applied and healing allowed to take place. The corneal epithelium regenerated, the stroma was of approximately normal thickness, and vision with a minus 0.75D. sph. was $20/25 - 1$.

With regard to the indication and limitations of lamellar keratectomy, this particular procedure has been replaced to a large extent by lamellar keratoplasty. The reasons for this are obvious; with reasonable expectation of restoring the thickness of the cornea by transplantation of donor material, a much more adequate dissection of the scarred cornea may be made, there is less postoperative danger of rupture of the cornea, the patient's postoperative course is materially shortened, and the donor material apparently has some therapeutic effect.

Dr. Troutman said that he felt that the case just cited was one of the few indications

for the use of lamellar keratectomy. In this case the disease was limited to the anterior third of the cornea, where it was not well demarcated; the eye was somewhat irritable and there was corneal vascularization.

Our surgical technique of lamellar keratoplasty consists essentially of a partial penetrating trephination of the donor and recipient corneas with removal of the buttons by sharp dissection with a Bard-Parker knife or with the special knife used by Paufique.

Fuchs's dystrophy is such an unpredictable disease that its complete avoidance is certainly not possible. Every cataract case should be carefully examined with a slit-lamp and the presence or absence of cornea guttata or early endothelial changes that might be indicative of Fuchs's dystrophy should be recorded.

In the event of changes, one should make the section as scleral as possible, usually 1.0 to 1.5 mm. proximal to the surgical limbus, and as narrow as possible. A complete iridectomy should be done and a radial sphincterotomy should be done at the 6-o'clock position to give a wide pupil in event of central opacities. The lens is then removed by the sliding technique of Verhoeff for more facile delivery with a small section.

Once Fuchs's dystrophy has developed, the results of treatment are very discouraging, and surgery may offer the only hope of restoring vision. Dr. Troutman reported that he had several cases of Fuchs's dystrophy with clear penetrating grafts; and several cases with relief of symptoms, but without visual improvement. Forty-one percent of the cases operated showed visual improvement to 20/20 or better.

With regard to the treatment of dendritic keratitis, routine iodine cauterization appears to be as effective as anything else according to Dr. Troutman. The use of cortisone is of questionable value. In late cases of dendritic keratitis, where there is extensive corneal involvement, penetrating keratoplasty after irradiation of vessels by beta radiation was discussed. The results depend on the degree of vascularization at the time of the operation.

Bernard Kronenberg,
Recording Secretary.

Ophthalmic Miniature

Of the First of the Ocular Diseases due to Excess of Phlegm

Let us begin in the name of Christ to speak of the various eye affections that are produced by excess of phlegmatic humor. In many instances watering of the eyes sets in, and this may be the cause of three different and distressing troubles. The first of these is a softening of the lids whereby a growth of wild hairs is engendered. These scratch the eyeball and the pupil and a paniculous eye is the result; the patient is unable to open his eyes until the hairs have been extracted, after which he will see as well as ever until they grow again, when he will be even worse than before. I believe the hairs ought not to be pulled out, because when they are they return coarser, more numerous, and stiffer—like pig's bristles—and as a consequence they irritate the eyes more than at first. Many persons from the severe scratching lose their eyes altogether.

Benevenutus Grassus of Jerusalem:
De Oculis Eorumque Egritudinibus et Curis,
Translated by Casey A. Wood, 1929.

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THE POST TESTIMONIAL PROGRAM

The Post Testimonial Program was held at the Washington University School of Medicine in Saint Louis on March 28, 1953. This event was planned to honor Dr. Lawrence T. Post on the occasion of his retirement as professor of ophthalmology and chairman of the Department of Ophthalmology after serving 20 years in that position. The program consisted of a scientific session held during the day and a testimonial dinner that evening.

The scientific session was held in the auditorium of the medical school with Dr. M. Hayward Post presiding at the morning session and Dr. B. Y. Alvis during the afternoon. About 150 ophthalmologists attended the scientific program, which was presented by 15 of Dr. Post's close friends and con-

freres in American ophthalmology and consisted of the following papers:

1. "What is the proportion of real senile cataracts in old patients on whom a lens extraction operation is performed?" Moacyr E. Alvaro, M.D., São Paulo, Brazil. Read by title only.

2. "The use of peritoneum as a substitute for conjunctiva in plastic surgery: A preliminary report," James H. Allen, M.D., New Orleans, Louisiana.

3. "Akinesia of the orbicularis," Walter S. Atkinson, M.D., Watertown, New York.

4. "Malignant exophthalmos: Etiology and treatment," Alson E. Braley, M.D., Iowa City, Iowa.

5. "Foveal co-ordination," A. D. Ruedemann, M.D., Detroit, Michigan.

6. "Metastatic intraocular melanoma," Derrick Vail, M.D., Chicago, Illinois.

7. "Iridectomy for drawn-up pupil," Paul Chandler, M.D., Boston, Massachusetts.

8. "Reading difficulty (paralexia) from impairment of visuo-oculogyric adjustment," Donald J. Lyle, M.D., Cincinnati, Ohio.

9. "Subhyaloid hemorrhage following subarachnoid hemorrhage," Frederick C. Cordes, M.D., San Francisco, California.

10. "Diabetic retinopathy," Jonas S. Friedenwald, M.D., Baltimore, Maryland.

11. "Observations on cataract surgery," Everett L. Goar, M.D., Houston, Texas. Read by title.

12. "A technique for total biopsy of neoplasms of the iris: Report of a case of removal of a leiomyoma," Daniel B. Kirby, M.D., New York, New York.

13. "The hypertensive response of the human eye to anterior chamber puncture," Peter C. Kronfeld, M.D., Chicago, Illinois.

14. "Variations of the normal endothelium of the cornea," A. Ray Irvine, M.D., Beverly Hills, California.

15. Present concepts of surgery of the superior oblique," William P. McGuire, M.D., Winchester, Virginia.

These papers given at this scientific session make up the bulk of the present issue of THE AMERICAN JOURNAL OF OPHTHALMOLOGY—the "Post" number. It is obvious that these papers represent a definite contribution to the literature of American ophthalmology.

The highlight of the program was the dinner given in Dr. Post's honor that evening in the Tiara Room of the Park Plaza Hotel. A capacity crowd of approximately 270 people were in attendance, the group being made up of Dr. Post's friends, confreres, former residents, and ex-students, with every part of the country being represented. Dr. William James, the first resident in ophthalmology at Washington University School of Medicine, presided as toastmaster. He presented a group of speakers who gave short résumés of Dr. Post's achievements and contributions to various phases of American ophthalmology throughout the years.

The greetings of Chancellor Arthur H. Compton of Washington University were read in his absence by the assistant to the chancellor, Mr. John Talbot. Dr. Derrick Vail of Chicago discussed Dr. Post's services to THE AMERICAN JOURNAL OF OPHTHALMOLOGY, including his many years as Editor-in-Chief. Dr. William L. Benedict of Rochester, Minnesota, executive secretary of the American Academy of Ophthalmology and Otolaryngology, outlined Dr. Post's activities in that organization. He also announced that Dr. Post had been chosen as the Guest-of-Honor for the 1953 meeting.

In a like manner Dr. Post's activities in a number of national ophthalmological organizations were outlined by an officer of that particular organization; Dr. Francis Heed Adler, the present chairman, representing the Section on Ophthalmology of the American Medical Association, the American Ophthalmological Society by its president, Dr. Conrad Berens, the Association for Research in Ophthalmology by the secretary, Dr. James H. Allen, and the National Society for the Prevention of Blindness by its executive director, Dr. Franklin M. Foote.

The offices and honors bestowed upon Dr. Post by these organizations are outlined in his "Curriculum Vitae" on page 1191 of this JOURNAL.

Dr. Post's services to the local medical center were discussed by Dr. Frank Bradley, medical director of Barnes and McMillan Hospitals. The ex-residents and former students of Dr. Post were represented by Dr. Howard A. Slaughter of Evansville, Indiana, the president of the Washington University Residents' Association. He praised Dr. Post not only as an outstanding teacher of ophthalmology, with postgraduate training as his first interest, but also as an unvarying example of the proper ethical aspects of ophthalmic practice. His observations on Dr. Post's family and home associations were seconded by all those present.

Dr. T. E. Sanders reported for the Committee on Arrangements. This committee during the past year raised a sum of money from Dr. Post's staff, ex-residents, and former students, to be used by Dr. Post in whatever way he so wished. It was Dr. Post's desire that this fund be presented to the Department of Ophthalmology, Washington University School of Medicine, to be used as a permanent Eye Research Fund. It is hoped that this fund will continue to grow by future contributions not only by Dr. Post's associates in ophthalmology, but also by many of his lay friends and patients.

In the fall of 1952 the local committee commissioned a portrait of Dr. Post by Mr. Charles A. Galt. Both the portrait and fund were presented by Dr. Sanders to Dr. Robert A. Moore, Dean of the Washington University School of Medicine. Dr. Moore, in accepting the portrait and the fund, praised Dr. Post's achievements as a medical teacher and an administrator, his remarks being included on page 1190 of this JOURNAL.

Appropriately, the activities of the evening were brought to a close by a few remarks by the Guest-of-Honor. He soon made evident the qualities that not only brought him the honors outlined by the previous speakers, but also the reasons for the respect and affection of those with whom he is associated.

To round out a week-end of activity, the Midwestern Section of the Association for Research in Ophthalmology held its annual meeting on Friday, March 27th, the day preceding the Post Testimonial Program. This program was given in the Elliot Auditorium of the Oscar Johnson Institute with the Chairman of the Section, Dr. T. F. Schlaegel, Jr., presiding. It consisted of 12 outstanding papers:

1. "Experimental granulomatous uveitis: Studies on the mechanism of production of the contralateral reaction after the use of horse serum in rabbits," T. F. Schlaegel, Jr., and Fred Wilson, Indiana University, Indianapolis.

2. "Residual accommodation under homatropine-cocaine cycloplegia," Paul M. Brickley, Mayo Clinic, Rochester, Minnesota.

3. "Aqueous outflow measurements by continuous tonometry in rarer forms of glaucoma," B. J. Mansheim, State University of Iowa, Iowa City.

4. "A classification of retrolental fibroplasia, with some additional observations of the clinical course," Ivan E. Hix, Jr., University of Colorado, Denver.

5. "Experimental use of polyethylene in the eye of the rabbit," Donald T. Hughson, Marquette University, Milwaukee, Wisconsin.

6. "Growth of lens epithelium in culture," Bernard Schwartz, Betty Danes, and P. J. Leinfelder, State University of Iowa, Iowa City.

7. "The effect of local cortisone on wound healing in rabbits," E. S. Palmerton, University of Minnesota, Minneapolis.

8. "Bacteriologic studies in newborns using terramycin, terramycin-polymyxin-B, and silver nitrate," T. H. Willcockson and Charles B. Cox, University of South Dakota, Vermillion.

9. "Mechanism of the miotic-resistant pupil with increased intraocular pressure,"

George S. Tyner, University of Colorado, Denver.

10. "Some contributions to the clinical application of electroretinography," George W. Bounds, Jr., and Bruno Bagolini, State University of Iowa, Iowa City.

11. "On the enzymology of the vitreous," A. E. Zeller, Northwestern University, Chicago, Illinois.

12. "Electrolyte changes of the lens following radiation," David Schoch and Jacob Krakusin, Northwestern University, Chicago, Illinois.

This section program represents a group of contributions in research ophthalmology that would be a credit to the national program of this organization. This fine group of papers is due to the efforts of the secretary, Dr. Alson E. Braley, of Iowa City.

Friday evening the St. Louis Ophthalmological Society honored Dr. Post at its regular March meeting with a dinner at the Park Plaza. As the Guest-of-Honor, Dr. Lawrence T. Post presented the paper of the evening entitled "Results of two hundred recession operations." Dr. M. Hayward Post also contributed to the program with a paper on "Protection of instruments from dust-borne contamination and sterilization of certain solutions by ultraviolet radiation." Dr. H. Rommel Hildreth read a communication on "The tendon transplanting operation." The papers of Dr. M. Hayward Post and of Dr. Hildreth are also included in the present JOURNAL.

To those of us who had the privilege of attending this program, it will long remain a unique experience. The success of this venture is clear evidence of the high esteem in which Dr. Post is held by all of his friends who participated in the program either by scientific papers, monetary contributions, or by attendance. However, all of us who know him realize that it was no more than he deserves.

T. E. Sanders.

CONCILIUM OPHTHALMOLOGICUM UNIVERSALE

A meeting of the International Council of Ophthalmology was held in Paris on June 20 and 21, 1953. There were present: Duke-Elder (president), Berens (vice-president), Hartmann (secretary), Amsler (treasurer), Bailliart (president International Association against Blindness), MacCallan (World Organization against Trachoma), Alvaro (Brazil), Bietti (Italy), Charamis (Greece), Duggan (India), Ehlers (Denmark), Law (Great Britain), Löhlein (Germany), Samuels (United States), Stuart Ramsay (Canada), Velter (France), Fritz (secretary for Internationalizations), Copper (secretary for the Index Ophthalmologicus).

Apart from the routine matters the main business of general interest was as follows:

1. XVII International Congress of Ophthalmology. It was unanimously decided that the scope of this congress might be extended to become a Canadian-American Congress to be held from September 10 to 17, 1954, September 10th and 11th to be held in Montreal, Canada and, as previously arranged, September 12th to 17th in New York.

The council accepted the invitation of the Council for International Organizations of Medical Sciences to hold a symposium on the subject of glaucoma in association with this congress.

2. International standards. The reports of the commissions dealing with international standards for color vision, tonometry, and the visual requirements for (various forms of) transport were finally accepted. Adequate standardization of the light sense was considered impracticable and the activities of this commission were closed. The commission dealing with the international standardization of visual acuity (optotypes) was given a further year to produce an agreed report. An interim report was received from

the commission studying ophthalmologic education in various countries.

3. Index Ophthalmologicus. Arrangements were made for the publication of the index and its sale at the XVII International Congress. It is proposed that this index will be more comprehensive and useful than hitherto; it will contain the names and addresses of ophthalmologists in most countries of the world as well as a list of ophthalmic hospitals, journals, and other information of ophthalmic interest and a résumé of the activities of the council.

4. The International Ophthalmological Dictionary. It is hoped that this *Dictionary of Ophthalmological Terms* in English, French, German, Spanish, Italian, and Latin will be available at the XVII International Congress.

5. New statutes governing the International Federation of Ophthalmological Societies, the International Council of Ophthalmology, and the International Congresses were finally adopted by the council for presentation to the meeting of the federation to be held in Canada in 1954.

6. The Gonin Medal. The council awarded the Gonin medal to be presented at the opening ceremony of the XVII International Congress to Sir Stewart Duke-Elder.

7. It was decided that the surplus money over from the XVI International Congress should be used to assist people to attend the XVII International Congress who would make a contribution to this congress but would be precluded from attending it for financial reasons. The distribution of the money was entrusted to the president, the secretary, and the treasurer of the International Council.

8. Löhlein's resignation from the council was regretfully accepted and Thiel was elected in his place.

The next meeting of the council will be held in Canada in September, 1954.

Edward Hartmann, *secretary*,
2, Avenue Ingres, Paris, xvieme.

XVII INTERNATIONAL CONGRESS OF OPHTHALMOLOGY

The International Council of Ophthalmology has decided to extend the scope of the XVII International Congress of Ophthalmology by a two-day preliminary session in Montreal, Canada. This will take place on September 10 and 11, 1954.

Those who attend both meetings will travel to New York on September 12th and the opening ceremony of that part of the congress will be held in the Grand Ballroom of the Waldorf-Astoria Hotel on Monday morning, September 13th. The New York session will continue through Friday, September 17th. Details of the two programs will be announced later.

A single registration fee will cover both the Montreal and the New York sessions of the Congress. Administrative affairs of the Congress will continue to be handled through the office of the Secretary General, Dr. William L. Benedict, 100 First Avenue Building, Rochester, Minnesota, U.S.A.

CORRESPONDENCE

Furacin in ophthalmology

Editor,
American Journal of Ophthalmology:

In the September, 1952, issue of The American Journal of Ophthalmology, an article, "The use of Furacin in ophthalmology," by Dr. James W. Brennan reported the results of 596 cases of external ocular diseases treated with topical Furacin (nitrofurazone) ointment and solution. Nitrofurazone is antibacterial to gram-negative and gram-positive bacteria, in vitro, and has been employed topically by surgeons and dermatologists.

Brennan's series of infectious conditions was comprised of acute and chronic conjunctivitis, blepharitis and blepharoconjunctivitis, corneal ulcers, and hordeolums. Of these, 85 percent were reported improved

with the Furacin treatment. A low incidence of allergic reactions, not specified quantitatively, was noted with the ointment.

An experimental series of cases compiled by me, prior to the publication of Brennan's article, was not as satisfactory in its results. In view of Brennan's report, however, my findings should be of some interest.

Forty cases of acute and chronic conjunctivitis, blepharitis squamosa, blepharoconjunctivitis, and keratitis were treated in this series. Of these, 24 were improved—16 moderately and 8 completely. Fourteen cases were not ameliorated, of which four experienced increased irritability with use of the medication. Two additional cases developed marked allergic urticaria and dermatitis of the lids and face. The improved cases, moderate and complete, totalled 60 percent, which constitutes a low percentage of alleviation for a topical antibacterial agent. Furthermore, most of the moderately improved cases, as well as the failures, which together constituted more than 50 percent, necessitated additional treatment. The irritative and allergic reaction to Furacin, in this series about 15 percent, is considered relatively high.

It is therefore recommended that Furacin be reserved for those conditions in which more familiar antibiotics and antibacterial drugs have not proved efficacious.

(Signed) Paul Hurwitz,
Chicago, Illinois.

BOOK REVIEWS

PROGRESS IN OPHTHALMOLOGY AND OTOLARYNGOLOGY. Volume 1, Part one: OPHTHALMOLOGY, edited by Meyer Wiener, M.D., and A. Edward Maumenee, M.D.; Part two: OTOLARYNGOLOGY, edited by Percy E. Ireland, M.D., and Joseph A. Sullivan, M.B. New York, Grune and Stratton, 1952. 653 pages and index. Price: $15.00.

This attempt to cover the advances in the special fields of ophthalmology and otolaryngology since 1946 is divided among some 72 contributors, each of whom has been made responsible for a chapter in the particular phase in which he is best qualified. This makes for an authoritative analysis of the outstanding contributions to the literature of the postwar period. The editors have obviously urged the contributors to be brief, an injunction which seems to have been variously interpreted, as some chapters are little more than outlines whereas others are quite detailed.

The book is beautifully printed and bound in pyroxilin-impregnated water-repellent cloth. Illustrations are scanty, as is to be expected in a work of this nature.

This volume may be recommended for the reader who seeks a general review of the important contributions in the fields of eye and ear, nose, and throat since 1946. The bibliography appended to each chapter offers valuable source material for further detailed reading.

William A. Mann.

TUMORS OF THE ORBIT. By Raymond G. Ingalls, M.D. Springfield, Illinois, Charles C Thomas, 1953. 410 pages, 140 illustrations, 91 tables, extensive reference bibliography, index. Price: $11.50.

Based on 216 cases diagnosed microscopically, the wealth of material contained in this monograph can hardly be surpassed. This is not a selection of cases for a representative group, but a consecutive series, obtained primarily from the Pathology Laboratory of the Institute of Ophthalmology of the Presbyterian Hospital. Dr. Ingalls incorporates a few specimens from the Head and Neck Clinic of the Memorial Hospital for the Treatment of Cancer and Allied Diseases, as well as some cases referred from outside sources in his series.

Twenty-seven different types of tumors are discussed in their order of relative frequency; one chapter is devoted to each variety. After a few general remarks con-

cerning the tumor in question, each group is analyzed according to origin, microscopic appearance, and mode of growth. A listing of the etiologic factors (such as sex, age, and race), anatomic location, shape, consistency, and color of the tumor and its symptoms (such as limitations of ocular motility, clinical characteristics, pain and tenderness) follows.

One table covers the chief complaint and history, age, sex, and the orbit involved. Additional tables pertain to: Location of the growth, relationship between visual acuity, exophthalmos and fundus changes, relationship between exophthalmos and size of the tumor. An invaluable table summarizes the entire group as to total number and its percentage in the entire series, age (youngest patient, oldest, average age), the distribution within the various decades, sex, orbit, swelling of eyelids, ptosis, pain, history of trauma, duration, intraocular pressure, and X-ray and laboratory findings. One representative case from each group serves as an example for a painstakingly detailed case history.

After the pertinent history, the clinical findings are presented in exemplary manner, including lucid X-ray and pathologic reports. Fascinating illustrations of the appearance of the patient, reproductions of the X-ray film and microphotographs add much to the visualization of the morbid process. A generous survey of reports in the literature during the past two decades concludes the chapter.

Ingalls employs a novel and stimulating way to present a difficult subject that usually causes a great deal of justified apprehension to the average practicing ophthalmologist. The volume should be a welcome and ideal introduction, particularly for the novice. Much credit should also go to the publisher for his fine arrangement and superb reproductions.

Perhaps it is not within the scope of such a presentation to cover treatment in detail. However, it would have been desirable for the author to be more specific in some instances as to the indications for surgery. For example, though the diagnosis of his case of myoblastoma was confirmed by biopsy, and it is stated that this tumor is benign in almost all instances, an exenteration was performed. No explanation is given for this radical operation on a supposedly benign tumor. Yet, the subsequent course did justify the procedure; despite the mutilating operation and further dissection of recurrences, generalized metastasis developed.

In two instances of metastatic orbital tumor, namely a neuroblastoma and a metastatic carcinoma, exenteration was carried out. Metastases were evident elsewhere in the first case. In the case of the carcinoma, the search for other manifestations of a tumor proved negative. Nevertheless, the patient was operated, in spite of a preceding biopsy diagnosed as metastatic carcinoma.

Controversial topics are avoided, ostensibly for the sake of simplification. Such an endeavor seems satisfactory if it does not lead to oversimplification. For instance, all lymphoid tumors are listed under the general heading of lymphosarcoma, and all are considered malignant. It appears, at least to this reviewer, doubtful to consider every isolated lymphocytoma of the orbit a priori a malignant growth.

These few critical remarks ought in no way detract from the enormous efforts put forth into the compilation of the tremendous material and its statistical evaluation. The manner of presentation is refreshingly unique and may well serve as an example for similar treatment of other selected topics of our specialty.

Stefan Van Wien.

L'Année Therapeutique en Ophtalmologie. Volume III. Edited by G. E. Jayle and A. Dubois-Poulsen. Paris, L'Expansion Scientifique Française, 1952.

Clothbound, 528 pages, illustrated. Price: 1,600 francs.

The current volume of this highly successful project follows the original orientation but the perspective has been expanded. An associated international editorial committee includes Berens, Cordes, and Vail as United States representatives. The annual is now linked to a new organization under its sponsorship, Les Entretiens Annuel d'Ophtalmologie, the first meeting of which, June 26 to 28, 1952, immediately after that of the French Ophthalmological Society, set the pattern to be followed in 1953 and subsequently. The papers presented are contained in this volume under three general captions—therapy in clinical ophthalmology, therapeutic deductions from ophthalmic pathology, and animal experimentation. Though the text is French throughout, there are many prominent contributors outside the French domain such as Arruga of Barcelona on a novel integrated implant, Soria of Barcelona on paralytic lagophthalmos, Bietti of Parma on vitamin E, Weve of Utrecht on intraocular tumors, Streiff of Lausanne on allergy, and François of Ghent on hypertensive uveitis.

The pages scintillate with ingenious therapeutic suggestions such as the following: Ultrasonic vibration is recommended in Eales' disease to facilitate the absorption of blood. In optic neuritis the cervical spine should be studied by X ray; if a slipped disc is demonstrated rapid recovery follows traction and extension. In hypertensive uveitis the injection in the anterior chamber of hyaluronidase (15 TRU—not more) is safe and effects a lowering of tension and disappearance of flare. Daily subcutaneous injections of insulin (10 U.) enhance the hyaluronidase content of the ocular fluid and so facilitate the absorption of vitreous haze and the clarification of corneal grafts. X-ray therapy in low dosage is a valuable adjunct in the treatment of virulent furuncles, orbital cellulitis, and epiphora. Caustic burns of the globe react favorably to vasodilatation, and priscoline or nicotinic acid in 10-percent concentration is instilled hourly. Thyrotropic exophthalmos is apparently ameliorated by retrobulbar injections of cortisone. Curare is advised for cataract extraction under surface anesthesia but combined with lid akinesia; but the resulting hypotension contraindicates its use in keratoplasty.

In accordance with French custom, each of the annuals contains a fine analytic table of contents. In this volume an index has been introduced but that innovation is for the contents of the previous issue! Gallic imagination and the absence of pedantic dogmatism make these annuals lively reading as well as treasured guides to the widespread frontiers of ophthalmic therapeutics.

James E. Lebensohn.

Patologia Ocular. Volume 1, 1952. Periodic publication of the Centro de Instrução Oftalmológica of the Paulo Filho Eye Clinic, 63 Avenida Fátima, Rio de Janeiro, Brazil.

The foreword of this 200-page volume states that this and future volumes will contain ophthalmologic works presented before the Study Center of the Paulo Filho Eye Clinic. The introductory article by A. Paulo Filho briefly describes the aims and purposes of the Study Center and names its founders. The material in this first volume includes papers on sarcoidosis, the retinopathies, ocular pemphigus, iris atrophy, aniridia, pupillotonia (Adie's syndrome), orthoptics, the ophthalmic division of the trigeminal nerve, and a number of abstracts from the ophthalmic literature dealing with pertinent subjects. The articles are followed by adequate bibliographies.

The editor and authors of this contribution to South American and Western Hemisphere ophthalmology are to be congratulated for their efforts. It is to be hoped that this series will meet with well-merited success and that the high caliber of the contents of this volume will be continued in the future.

Charles A. Perera.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

5

DIAGNOSIS AND THERAPY

Akiya, S. **Relationship between tuberculous diseases of the eye and resistance of capillaries.** Acta Soc. Ophth. Japan **57**:299-301, June, 1953.

In 24 cases of tuberculous disease of the eye, a weakness of skin capillaries was demonstrated by Rumpel-Leede's and Borbély's test in 13 and 12 cases respectively, while of the 39 control cases it was positive in 5 and 10 subjects by these tests respectively. The reaction seems to be more highly positive in subjects with tuberculous eye diseases. In three such cases, a recovery of the capillary resistance was demonstrated with a reduction of ocular symptoms.

Yukihiko Mitsui.

Garrigosa Cenicetos, Cristobal. **Electronic retinal camera.** Arch. Soc. oftal. hispano-am. **13**:60-65, Jan., 1953.

At the suggestion and with the help of Dr. Castroviejo the author designed a retinal camera with a 100-Watt stroboscopic light for illumination. This is a preliminary report on the construction of the apparatus. The use of the flashlight makes possible rapidity of photography and clearer pictures. A light from an additional globe of 12 volts, placed outside the axis of the photographic beam and refracted by a prism on the pupil is used for focusing. The general design of the camera is similar to that reported in 1934 by Rivas Cherif. An advantageous feature of the apparatus is the utilization for photography of an Exacta of Contax camera, which can be dismounted from the apparatus and used for other photographic purposes. (4 figures)

Ray K. Daily.

Monjé, M. **The near point of accommodation and convergence.** Klin. Monatsbl. f. Augenh. **122**:417-422, 1953.

A device, called a "Proximeter," is described, which allows a quick measurement of the near point of accommodation and of convergence. (20 references)

Frederick C. Blodi.

Narog, Franciszek. **Two cases of central retinal and choroidal tuberculous inflammation treated with streptomycin.** Klinika Oczna **22**:433-435, 1952.

The author describes two cases of central tuberculous retinitis and choroiditis. Both occurred in men, 32 years of age, who had tuberculous lesions in other

parts of their bodies and who were therefore under medical supervision. Each one received 15 gm. of streptomycin in addition to general supportive treatment. In less than a month intraocular lesions were healed. Sylvan Brandon.

Nicolai, H. **Objective determination of the visual acuity with optokinetic nystagmus.** Klin. Monatsbl. f. Augenh. **122**:402-416, 1953.

A checkerboard is used for elliciting the nystagmus. The eye is observed with a corneal microscope. The method is excellent for detecting malingerers. (3 figures, 7 charts, 6 references)

Frederick C. Blodi.

Oliveira, Decio Brito. **Experiences with ACTH and cortisone.** Rev. brasil oftal. **10**:17-23, Sept., 1951.

The author briefly reviews the basic experiments with ACTH and cortisone. He mentions that 60 cases have been reported to him by his coworkers. He specifically reports 13 cases. The results are similar to those found in North America, namely that the drugs are especially helpful in afflictions of the anterior segment and allergic manifestations of the cornea and conjunctiva. Theodore Bisland.

Ricci, A., and Buonsanto, M. **Ultrasound therapy in ophthalmology.** Boll. d'ocul. **32**:107-118, Feb., 1953.

After animal experiments, the authors applied ultrasound to diseased human eyes. Ten patients were studied. No improvement of inflammatory changes was noted but in traumatic conditions hemorrhages and exudates were favorably influenced. (1 table (dosage); references)

K. W. Ascher.

Riehm, W. **When will a pulmonary tuberculosis exclude a focal tuberculosis of the eye?** Klin. Monatsbl. f. Augenh. **122**:468-476, 1953.

A focal infection from an active pulmonary lesion will not occur, because the antibodies increase during this period and prevent any metastasis. Only when the pulmonary lesion heals (permanently or temporarily) is a focal infection possible. (5 references) Frederick C. Blodi.

Scholtyssek, H. **Serologic diagnosis of toxoplasmosis in adults.** Klin. Monatsbl. f. Augenh. **122**:452-468, 1953.

This is an evaluation of the complement fixation test and the methylene blue test for toxoplasmosis. Strongly positive results were found in about 12 percent of 283 patients with chronic inflammations of the eye, but the same percentage of positive results was found among 162 unselected patients of the tuberculosis station. The importance of repeated tests is emphasized. The titer decreases markedly under aureomycin or terramycin treatment. (7 figures, 28 references)

Frederick C. Blodi.

6

OCULAR MOTILITY

Marquez, M., and De Rivas Cherif, M. **The coincidence method in the study of binocular diplopia.** Rev. oto-neuro-oftal. sud am. **28**:6-12, Jan.-Feb., 1953.

The authors refer to the "coincidence method" developed by Marquez in 1922 for the study and evaluation of diplopia. Two new factors were introduced: 1. the primitive spasm of the external ocular muscles and 2. a graphic chart with which a diagnosis of the type of disturbance was obtained by the way of simple "coincidences." In 1941 this method was published in Mexico and found opposition among ophthalmologists, who believe that in cases of spasm the action, and therefore the diplopia, ought to be increased in the field of action of the spasmodic muscle.

It is obvious that in paralysis the eye deviates in a direction opposite to the

field of action of the affected muscle, but the disagreement appears in considering what occurs in the case of a muscular spasm. The authors of this paper believe that the diplopia may increase, decrease or remain unchanged, but always exists when the eye is directed in a direction opposite to the action of the spasmodic muscle; and decreases until it finally disappears when the eye is directed into the field of action of the spasmodic muscle. The opponents believe that the diplopia increases in the direction of action of the spasmodic muscle, and decreases in the opposite direction.

The authors point out that the opponents to this theory do not consider at all the "visual purpose" of the ocular movements. A fundamental fact is the principle of direction, which establishes that the eye tries to adopt the most favorable position in relation to an object, so that its image will form at the fovea centralis. The authors describe several practical examples to support their theory. The study is to be continued. (4 figures) Walter Mayer.

Sebas, S. Raphael. **Ametropias in infancy and their correction.** Rev. brasil oftal. **10**:3-14, Sept., 1951.

The author briefly reviews the optical, anatomic and physiologic principles of hypermetropia and myopia. He advises that in treating ametropic children, the ophthalmologist also send them to an orthoptic clinic rather than just prescribe lenses. The use of rythmic exercises, contracting and relaxing completely the accommodative mechanism, is used to build up the power of Müller's muscle, making the use of corrective lenses unnecessary. Likewise, in myopia, abduction exercises and divergence exercises are believed to have active effect on Brücke's muscle. Sebas believes that by taking positive action along these lines, the use of corrective lenses will be reduced and the patients will be kept from the hands of the charlatans who purport to cure their visual difficulties with one or the other of their panaceas. Theodore Bisland.

7

CONJUNCTIVA, CORNEA, SCLERA

Balavoine, C. **Acquired retrocorneal hyaline formations.** Ann. d'ocul. **186**:11-140, Feb., 1953.

In two of the cases discussed the hyaline network was in the anterior chamber (bilateral in one, unilateral in the other) and followed an interstitial keratitis; the third case was one of buphthalmos (the patient had had an infantile glaucoma) and the hyaline striae were found on the posterior surface of the cornea.

Retrocorneal hyaline formations have generally been classified as posttraumatic, postinflammatory or due to malformations. The author suggests a more satisfactory classification: 1. acquired, which would include the little known hyaline striae seen in buphthalmos as well as posttraumatic and postinflammatory, and 2. congenital malformations of the posterior corneal surface and of the anterior chamber.

Microscopic examination of the hyaline network in one of the cases discussed (removed during a keratotomy) showed that the striae were formed by endothelial cells which had secreted a collagenous substance that formed the center of the striae. The author suggests that the endothelial cells proliferate to form filaments which anastomose in similar fashion as do the endothelial cells of the cornea in tissue cultures. (12 figures, 94 references) B. T. Haessler.

Bruna, F. **More about Fehr's corneal dystrophy.** Boll. d'ocul. **32**:74-80, Feb., 1953.

In a previously described patient, Bruno removed discs from the cornea and

stained the gelatin-embedded, frozen sections with haematoxylin-sudan III and sudan III. No lipid substances were found. Pertinent publications by other investigators who studied the lipids in hereditary corneal dystrophies are discussed. (2 figures, references)

K. W. Ascher.

Legrand, J., and Hervouet, F. **Marginal ectasia of the cornea (Terrien's disease).** Ann d'ocul. **186**:97-110, Feb., 1953.

A case of this rare condition, first seen by the authors in 1938 when the patient was 19 years old, and operated upon 13 years later, made a detailed study of the micropathology of the lesion possible. During childhood the patient had a positive tuberculin test and a possible tuberculous adenitis. Visual acuity was 6/10 in both eyes. In 1945 the right eye was unchanged, but the left eye had developed a corneal staphyloma and marked thinning in the upper quadrant. Treatment at this time consisted in instilling miotics. In 1951 a severe keratocele and repeated attacks of inflammation persuaded the patient to submit to an operation. The authors described the hemikeratoplasty which they performed on the left eye, under local anesthesia. Three months later a glaucoma with anterior synechia in the temporal region was relieved by total iridectomy. Vision rose to 4/10 whereas in the right eye it had fallen to 3/10. The keratoplasty was therefore of distinct benefit.

The sections of the corneal fragment are of particular interest because no intercurrent infection had modified the primary disease. Marginal ectasia may be compared to syphilitic interstitial keratitis: invasion followed by recession; low-grade infection with corneal dissolution which leaves behind a general thinning of the ectasia. The authors point out particularly the evidence of inflammatory phenomena in the corneal tissue proper and the many new-formed bloodvessels. (29 figures)

B. T. Haessler.

Orzalesi, F., and Ciuffo, P. **The tissue danger occurring in stored corneas and their influence upon the postoperative course of keratoplasty.** Ophthalmologica **125**:91-111, Feb., 1953.

The recent views concerning the causes of clouding of corneal transplants (maladie du greffon) are reviewed. In tissue extracts prepared from corneas stored in different media and for varying periods the authors have found a histamine-like substance that causes increased capillary permeability and leucocytic exudation. The effects of this substance are to some extent inhibited by cortisone. The pathologic changes occurring in corneal grafts are probably due to allergic reactions between graft and host. (4 figures, 54 references)

Peter C. Kronfeld.

Paufique, L., and Moreau, P-G. **Ligneous conjunctivitis.** Ann. d'ocul. **186**:12-33, Jan., 1953.

Some 15 cases of this rare disease have been reported in the literature and the authors add three of their own. Ligneous conjunctivitis is a disease of youth, most frequent between two and six years of age and much commoner in girls than in boys. Three modes of onset have been described. 1. A virulent mucous membrane infection, beginning in the nose and throat, with little or no adenopathy is soon followed by a fulminating conjunctivitis which leads rapidly to corneal perforation. 2. The onset of conjunctivitis is insidious; a preceding angina has possibly been overlooked. 3. In one case described in this paper a traumatic accident preceded the onset of the disease. The chief ocular manifestations are: 1. proliferation of false membranes on the conjunctiva, usually on the upper lid; 2. woody induration, easily felt by palpating the lid (the induration is granulomatous and rapidly

reforms if removed); and 3. severe lesions of the cornea which go on to perforation. The disease may affect both eyes simultaneously or serially. In all reported cases the eyes were eventually lost and no treatment, medical or surgical, was effective. However, two of the authors' patients, treated with beta radiation, were apparently cured.

The pathology underlying the disease is still unknown. Probably there is a virus infection. Weill sees an analogy to vernal conjunctivitis, whose etiology is also unknown. In this paper the authors describe the pathologic anatomy, illustrated with photomicrographs, report the case histories of the three patients seen by them, and discuss the treatment with beta radiation. (7 figures, 1 reference)

B. T. Haessler.

Rabadan Fernandez, Pedro. **Aureomycin in the therapy of trachoma.** Arch. Soc. oftal. hispano-am. **13**:79-99, Jan., 1953.

From a review of the literature it appears that aureomycin influences favorably all forms of trachoma, with or without corneal complications, but has no effect on the regressive cicatricial processes. The local application of aureomycin in solution or ointment is equally effective, the ointment being preferable because of its stability, and the somewhat irritating effect of the solution. The local action of the drug may be reinforced by its oral administration. The author reports in detail the results in 186 patients with trachoma treated in the various trachoma dispensaries in the trachoma-infested region of Spain. There were 93 cases of incipient trachoma, 10 of trachoma with pannus, 15 of incipient trachoma with complications, 27 of chronic trachoma, 15 of complicated trachoma, 25 of conjunctivitis, and 1 case of vernal conjunctivitis and superimposed trachoma. The treatment consisted in the application of aureomycin every one to three hours, depending on the severity of the process, from six in the morning until midnight. Atropin was used when indicated. The tabulated data show that a complete cure was obtained in 137 cases; recession of pannus in all 37 cases; improvement in 9 cases; and cure of the trachomatous process in the case of vernal catarrh. The treatment had no effect on cicatricial trachomatous changes. The author concludes, on the basis of this experience, that aureomycin therapy is the most effective and simple method of dealing with trachoma, and that it should be regarded as etiologic therapy. (1 table)

Ray K. Daily.

Salleras, Alejandro. **Total penetrating keratoplasty with phacoerisis.** Arch. oftal. Buenos Aires **27**:525-531, Dec., 1952.

A film showing the operative results and procedures in a number of patients was presented. Some of the patients had had corneal lesions (leucomas, anterior synechiae, and anterior polar cataracts) since birth. In twelve of 82 patients, a total, penetrating keratoplasty was done and in 11 of these a phacoerisis was also done at the same time; 45 percent showed some improvement in vision, though in none of them was there a vision of 0.1. These results are not so good as those of Castroviejo who reported 57 percent success but the results are encouraging since nothing else could have been done for the patients. Joseph I. Pascal.

Tano, Y. **An epidemic of keratitis disciformis in the Banshû-district.** Acta Soc. Ophth. Japan **57**:288-295, June, 1953.

There is an epidemic of keratitis disciformis in the Banshû-district of Japan. Thirty cases entered Tano's office in three years. After a detailed description of clinical symptoms, he states that the disease is unilateral and occurred in persons 20 to 49 years of age, from July

to August, and from January to March. He considers the causative agent to be a herpeslike virus. Yukihiko Mitsui.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Kapuscinski, Wiltold, and Wrubel, S. **Permeability of the blood aqueous barrier in uveitis treated with antihistamines and typhoid vaccine.** Klinika Oczna **22**:309-322, 1952.

Permeability of the blood-aqueous barrier was chosen as a criterion of the role of the allergic element in focal infection of the uvea. The intravenous fluorescein test was used. In 88 cases tested by the authors the antihistamines did not decrease the permeability of the blood-aqueous barrier. It was definitely decreased after the injection of typhoid vaccine. The authors concluded that either the allergic element in focal inflammation of the uvea is of no importance, or the antihistamines do not affect the histamine. The action of typhoid vaccine can be explained by stimulation of the pituitary, increased production of ACTH and stimulation of the reticulo-endothelial system and other resistance-producing tissues of the body. Whether the vaccine acts as an antihistamine could not be determined.

Sylvan Brandon.

Lubbers, P. **The etiology of ophthalmia lenta. Serologic examinations for leptospirosis.** Klin. Monatsbl. f. Augenh. **122**: 433-442, 1953.

Ophthalmia lenta is a term used by some authors for Behcet's syndrome. This syndrome has some similarity to the periodic ophthalmia of horses, which probably is a leptospirosis. The serologic examination of 13 patients for leptospirosis was weakly positive in three only. The tests were negative in the vast majority of the cases, as in all of the control series. (4 charts, 11 references)

Frederick C. Blodi.

Manzitti, Edgardo. **Heterochromic cyclitis of Fuchs.** Arch. oftal. Buenos Aires **27**:542-548. Dec., 1952.

The author describes the symptoms and the pathogenesis of heterochromic cyclitis of Fuchs. He emphasizes the profound vascular alterations found in a histologic study of a piece of iris obtained by an iridectomy. The lesions in the endothelial cells and the marked vascular sclerosis and atrophy make the hemorrhagic reaction described by Amsler and Verrey in puncture of the anterior chamber tenable as a pathognomic sign of heterochromic cyclitis.

Joseph I. Pascal.

Reimer, L. **Ocular complications after leptospirosis.** Klin. Monatsbl. f. Augenh. **122**:442-452, 1953.

The uveitis which is a sequela of a leptospirosis is believed to be so characteristic that a slitlamp examination may often establish the diagnosis. The anterior segment is only moderately involved. The eye is often white, the precipitates are small but may be numerous. The Tyndall phenomenon is noted, but there are practically no cells in the aqueous. There never is a hypopyon. In severe cases characteristic membranous opacities are found in the vitreous, and are often adherent to the disc. These opacities may persist for many years. The uveitis is always bilateral and the prognosis is good. Treatment is unsatisfactory. (7 figures, 14 references) Frederick C. Blodi.

Semadeni, B. **Chronic tuberculous uveitis.** Klin. Monatsbl. f. Augenh. **122**: 422-432, 1953.

The author discusses in general terms

his experiences with severe tuberculous uveitis in the Swiss sanatorium at Davos. The clinical course is described and it is emphasized that recurrences and complications are frequent. The differential diagnosis is briefly mentioned. Boeck's sarcoid is still believed to be a variant of tuberculosis. The therapy is discussed and the importance of rest and climate emphasized. The modern drugs are not so effective in ocular tuberculosis as they are in other forms of this disease. The author believes that local application of cortisone is often of value. (9 references)

Frederick C. Blodi.

9

GLAUCOMA AND OCULAR TENSION

Arato, S. **Results of angiodiathermy on the basis of 100 operations.** Ophthalmologica **125**:117-124, Feb., 1953.

Angiodiathermy is a cyclodiathermy aiming at obliteration of the long posterior ciliary arteries (cfr. Du Pont Guerry Am. J. Ophth. 27:1376, 1944). Just in front of the insertions of the internal and external rectus muscle the author makes two short vertical rows of diathermy punctures with a 1.5-mm needle electrode (after exposure of the sclera). The intensity of the current is 30 to 50 ma. and the duration of each puncture several seconds. The author's results are remarkably good. In 48 out of 58 eyes with simple glaucoma the ocular tension became normalized. In no other forms of glaucoma did the operation work quite as well. Peter C. Kronfeld.

Arkin, Wiktor. **Evaluation of antiglaucomatous operations.** Klinika Oczna **22**: 387-400, 1952.

The author lists the main antiglaucomatous operations, describes each in a few sentences, attempts to explain the mode of action of each, and summarizes the theories of intraocular flow of fluids. He describes in detail a few operations used by him and notes the indications and contraindications for each.

Sylvan Brandon.

Carreras Matas, Marcello. **Seclusion of the pupil and differential tonometry.** Arch. Soc. oftal. hispano-am. **13**:49-59, Jan., 1953.

The author designates differential tonometry as a method in which the tension is taken as usual, then a pressure of 40 mg. is applied to the sclera with a dynamometer, and the tension is taken again. The data are then evaluated by Bailliart and Magitot's scale. This method is useful for determining the accuracy of the tonometer. It is also helpful in arriving at a diagnosis of increased ocular tension in the posterior segment, when the tonometer placed in the cornea fails to reveal it. This is illustrated by a patient who complained of severe pain in a blind eye with a cornea so opaque that the anterior chamber was invisible. The globe felt hard to the touch, but the tonometer registered an ocular tension of 8 mm. Hg. A pressure of 40 mg. on the sclera raised the tonometric tension only 4 mm. Hg. This was but one sixth of the normal rise of pressure produced by this weight; it was therefore reasonable to conclude that the intraocular pressure was also six times that registered by the tonometer, which would be between 40 and 50 mm. Hg. The data indicated a seclusion of the pupil as a dense barrier between the posterior portion of the globe and the anterior chamber. The pain was relieved by the instillation of a solution of pilocarpine. Another patient with chronic iritis, iris bombé, and high ocular tension, had a normal response to 40 mgs. of pressure on the sclera. It was thus apparent that there was normal transmission of the ocular tension in the posterior ocular segment

forward through the iris. An iridectomy ab externo normalized the tension within a month. These cases demonstrate that the author's technique of differential tonometry aids in establishing a diagnosis of increased ocular tension behind the lens-iris diaphragm or of seclusion of the pupil in patients in whom the iris is invisible and in clarifying the discrepancy between a clinical picture and tonometric data. Ray K. Daily.

Krwawicz, T., and Holobut, W. **The influence of higher centers on the permeability of the blood-aqueous barrier.** Klinika Oczna **22**:265-269, 1952.

The authors feel that there is a central mechanism regulating permeability of the blood-aqueous barrier. Acetylcholine was injected intravenously into rabbits and the aqueous was collected during the period of shock. The presence and the concentration of acetylcholine in the aqueous was checked by the biological test on the isolated heart of a frog. The experiment included testing of the eyes after an iridectomy and the fellow eye which had had no surgery. There was an increased amount of acetylcholine in the aqueous in the operated eye and in the fellow eye by comparison with the amount found before the operation.

Sylvan Brandon.

Moulie, H. B., Arouh, J., and Lis, M. **Anterior glaucoma of Contino and Favaloro.** Arch. oftal. Buenos Aires **27**: 554-558, Dec., 1952.

A case is reported which confirms the existence of this pathologic entity. The patient, a 57-year-old woman, showed the characteristics of the syndrome described by Contino and Favaloro, to which may be added the inefficacy of miotics. A retrobulbar injection of alcohol and novocain produced a very strong analgesic effect, which persisted for a long time, and hypotony. The treatment is innocuous and may be repeated whenever it is thought necessary. Joseph I. Pascal.

Obal, A. **The treatment of glaucoma with progesterone.** Klin. Monatsbl. f. Augenh. **122**:480-483, 1953.

This is a rebuttal to a paper by Treumer (Klin. Monatsbl. f. Augenh. 120, 1952) in which the latter called Obal's progesterone therapy dangerous and inadvisable. This treatment is not dangerous, as it never increases the pressure, and, in the author's hands it has been valuable in controlling acute and chronic glaucoma. Treumer in his answer warns against any medical treatment of glaucoma used without proper control. Frederick C. Blodi.

Wittekind, I. **Fluorescence-microscopic examination of the skin in primary glaucoma.** Klin. Monatsbl. f. Augenh. **122**: 476-479, 1953.

Lampert distinguishes two constitutional types: 1. Type A, with slow responses, a tendency toward chronic diseases and a coarse skin, and 2. Type B with quick responses, acute forms of diseases and a smooth skin. An examination of the skin failed to reveal any difference in the distribution of the types in chronic glaucoma and in acute glaucoma. (1 chart, 11 references)

Frederick C. Blodi.

10

CRYSTALLINE LENS

Gozberk, Rifat A. **Infantile cataract and congenital syphilis.** Ann. d'ocul. **186**:141-154, Feb., 1953.

Cataract in children, whether congenital or acquired, is often associated with the stigmata of syphilis. Several cases have been reported in the literature and the author reports six which he has studied. In two of the patients the cataract, always bilateral, was associated with myxedema, and the Wassermann reaction

was positive; in the other four the Wassermann test was negative, although one of the patients had definite syphilitic stigmata. All showed a marked hypothyroidism; in one there was also muscular atrophy of the Werdnig Hoffmann type, in one spastic paraplegia, and in one there were convulsions.

The cataract of syphilitic children is secondary, due to insufficient thyroid secretion or, occasionally, to malfunction of the parathyroids. Generally associated with symptoms of neurosyphilis (sometimes infantile encephalopathy, sometimes a chronic spinal lesion), this type of cataract forms a part of the syndrome of thyroid insufficiency. Therefore any cataract in a child should suggest the possibility of hereditary thyroid deficiency. (2 photographs, 17 references)

B. T. Haessler.

Hartman, K. **The two-way syringe for suction of soft cataracts.** Klin. Monatsbl. f. Augenh. **122**:483-484, 1953.

The author praises the advantages of suction in the operation of soft cataracts and believes that the new syringe of Fuchs is a great step forward.

Frederick C. Blodi.

Rauh, W. **Sulfonamide powder and infections after cataract extractions.** Klin. Monatsbl. f. Augenh. **122**:257-261, 1953.

Postoperative infections have become a rarity since the advent of the sulfa drugs and the antibiotics. The author uses a sulfonamide powder which is put into the upper fornix after the operation and whenever the dressing is changed an ointment containing sulfathiazol and penicillin is instilled. In this way 215 cataract extractions were performed without postoperative infection. However, suddenly within three weeks, two cases of severe endophthalmitis followed the operation. It was found that the Mintacol solution used postoperatively contained pseudomonas aeruginosa. This miotic drug has to be dissolved in cold water. After the situation was corrected 102 more extractions were performed without any severe inflammatory reaction. (6 references)

Frederick C. Blodi.

Salleras, Alejandro. **Some commentaries on the surgical techniques in cataract operation.** Arch. oftal. Buenos Aires **27**: 549-553, Dec., 1952.

This is a film depicting various surgical techniques for cataract, including patient preparation and instrumentation. It utilizes the contributions of Elschnig, Kalt, Vogt-Barraquer, Verhoeff, Kirby and Castroviejo. Joseph I. Pascal.

Salleras, Alejandro. **Technique for extracting the crystalline lens in chronic iridocyclitis and glaucoma.** Arch. oftal. Buenos Aires **27**:539-541, Dec., 1952.

This film showed a method of extracting the opaque lens in chronic iridocyclitis and glaucoma which consisted of making a corneal incision with a lance and scissors, a large iridectomy above and a vertical iridectomy below. The lens is removed by tumbling at the level of the equator above. The use of cortisone and atropine postoperatively largely prevents complications. Joseph I. Pascal.

Scott, J. G. **Spontaneous rupture of the lens capsule.** Brit. J. Ophth. **37**:58-60, Jan., 1953.

Numerous cases of spontaneous rupture of the cataractous lens capsule have been reported and the author adds three cases, in two of which trauma was severe and in one very mild, but the lens had senile cataract. In each case rupture was followed by severe acute glaucoma and milky cortical fluid in the anterior chamber. The fluid was easily removed by irrigation and the glaucoma subsided. The glaucoma is ascribed to toxic effects of the lens protein and to obstruction of the

chamber angle drainage by the cortical material. Morris Kaplan.

Sobanski, Janusz. **New method of intracapsular extraction of a hard cataract.** Klinika Oczna **22**:401-406, 1952.

The method of intracapsular extraction of a cataract is described. The author uses a capsular forceps of his own design which permits the grasping of the capsule at the upper pole without the danger of catching the iris. The removal of the cataract is done by pressure with a hook or a spoon from below. The forceps guides the cataract out. Because tumbling of the lens is avoided the danger of vitreous loss is decreased. Breaking of the capsule is prevented by avoiding any pull on the capsular forceps. 116 cataracts were extracted by this method. In 12 the capsule broke before extraction, in 21 the capsule broke while still in the wound. Sylvan Brandon.

11

RETINA AND VITREOUS

Altenberger, Stanislaw. **Changes in the eyegrounds in anemia.** Klinika Oczna **22**: 357-368, 1952.

The author discusses the pathogenesis of changes in the eye in anemia. He based his observations on the examination of 108 anemic patients. The changes depend on the number of the red cells and the hemoglobin in a unit of volume of blood. The other components of the blood and the disease causing the anemia may influence the changes in the fundus.

Sylvan Brandon.

Amsler, M. **The early diagnosis and treatment of macular diseases.** Klin. Monatsbl. f. Augenh. **122**:385-388, 1953.

A fine net of squares, each of which has a length of 5 mm. is printed on paper and observed at 30 cm. distance. With the help of this device the earliest vague subjective symptoms of a macular lesion, especially metamorphopsia, can be detected. The subjective symptoms frequently precede the ophthalmoscopically visible signs and may so make possible an early therapeusis.

One patient with an early myopic degeneration of the macula is presented. (8 figures, 4 references)

Frederick C. Blodi.

de Arruda, Jonas. **The fundus of the eye in arterial hypertension.** Rev. brasil oftal. **10**:27-37, Sept., 1951.

The author notes that cardiologists, obstetricians and neurologists as well as ophthalmologists are taking more interest in the ocular fundus since it reflects various vascular changes that are present throughout the body. He elucidates the changes that the arterioles, veins, and A-V crossings undergo, as well as the changes in the retinal parenchyma and the papilla. His classifications and descriptions closely resemble those that are generally accepted in North American ophthalmic writings and teaching.

Theodore Bisland.

Carreras Matas, Marcello. **An initial sign of venous stasis in the retina.** Arch. Soc. oftal. hispano-am. **13**:160-173, Feb., 1953.

A deeper color in the distal segment of a retinal vein at an arterio-venous crossing is presented by the author as an initial sign of local stasis. From a study of the color of the retinal veins in over 1,000 fundi he concludes that this difference in color reveals the presence of venous stasis much earlier than is indicated by changes in the course and caliber of the retinal vessels. Its isolated occurrence in large venous trunks close to the papilla is of no significance, but its occurrence in multiple areas and in vessels of small caliber should be regarded as an early sign of arterial hypertension. In the ad-

vanced stages of hypertension it is associated with the other signs typical of retinal hypertension. In cases without significant changes in vessels walls it is frequently associated with Bonnet's sign. It may be seen at crossings at which the vein appears to be strangulated by the artery, but the difference in color may be present also without such compression. It is frequently seen at crossings with the Salus sign, where the vein makes a double curve. It was seen in cases with corkscrew venules, and in cases with capillarosis, hemorrhage, soft and dense exudates. (8 figures) Ray K. Daily.

Diaz Dominguez, Diego. **Macular degenerations.** Arch. Soc. oftal. hispano-am. **12**:799-992, Aug., 1952.

The various degenerative lesions of the fundus are divided into two large groups. In one is included Kuhnt-Junius disease, angioid streaks, retinitis circinata, and cystoid macular degeneration, lesions in which the parenchymatous tissues, predominantly the vascular tissues, participate in the process, causing edema and hemorrhages. The second group comprises all the tapetoretinal degenerations which occur chiefly in the neuroepithelium and are ectodermal in origin, without any participation of mesodermal tissues. In the first group therapy may be of some value; hemorrhages may be absorbed and the edema which is encountered to some extent in all macular lesions in this group, may recede. In the second group, the dystrophies involving the neuroepithelium, therapy is futile. There are borderline cases with processes such as choroidal sclerosis and drusen in the lamina vitrea which are encountered in both groups of lesions. The author believes that Pillat's conception of retinitis pigmentosa as a manifestation of premature senility applies also to the macular degenerations, and that careful investigation will reveal senile lesions in other organs. Only in myopia is the abnormal process limited to the eyes. A myopic eye is a senile eye, and in it may be encountered the entire range of senile lesions of the fundus: lesions of the lamina vitrea producing Fuchs's spot; rarification and destruction of the pigment epithelium; choroidal and retinal atrophy; lesions in the granular retinal layers and cystic degeneration in the periphery. All these changes may be found in exudative retinopathy as well as in tapetoretinal degenerations. Senility is the etiologic factor common to both groups; not normal senility, but a more or less generalized abnormal senility, caused by hereditary lesions in the thalamo-hypophyseal region, which controls growth as well as decline of the organism. This exhaustive monograph discusses in detail the symptoms of each form of the macular degenerations, includes an extensive bibliography, and is illustrated with 26 colored fundus drawings.

Ray K. Daily.

François, J., Verriest, G., and Mortier, G. **Hyperpyrexia by means of typhoid vaccine in the treatment of hypertensive retinopathies.** Ann.d'ocul. **186**:62-79, Jan., 1953.

Many causes underlie arterial hypertension: renal, cerebral, cardiovascular, endocrine and the unknown causes of essential hypertension. In this article only essential hypertension in its malignant form is considered. This condition cannot be influenced by medicine or diet, but extensive sympathectomy and fever therapy have been beneficial in certain cases. Heine, in 1920, and later others, gave milk injections in hypertensive retinopathy with striking results. Howard, in 1928, used typhoid vaccine, but the method fell into disrepute after criticisms by Brückner and Wick and was not resumed until 1944, when Taylor and Page used foreign protein injections. François and his co-workers treated four cases of

malignant hypertension by the intravenous injection of T A B Berna vaccine, which contains 1,000 million killed typhoid and paratyphoid A and B organisms per cc. It is given drop by drop in five percent glucose solution, according to the method described in 1942 by Solomon and Somkin. The first injection of 100 million organisms (0.1 cc.) is increased up to 750 million, given in two hours, later in one hour, sessions. Generally the patient receives six treatments a week, a total of 60. Of the four cases reported here, two showed good general and local improvement; in the other two there was improvement in the patient's general condition but the retinal lesions were either too discrete or already irreversible, so that no changes could be seen. (11 figures, 30 references) B. T. Haessler.

Fujimura, M. **Pigmentary crescent after pneumo-encephalography.** Acta Soc. Ophth. Japan **57**:389-391. June, 1953.

Fujimura describes three cases in which a pigmentary crescent appeared at the nasal side of the optic nerve disc after a pneumo-encephalography.

Yukihiko Mitsui.

Leydhecker, W. **The water drinking test in retinal detachment.** Klin. Monatsbl. f. Augenh. **122**:272-276, 1953.

It has been claimed that drinking of one liter of water will increase the intraocular pressure in patients with retinal detachment (de Decker, Santoni). The author tested 19 patients and found no significant rise in the intraocular pressure except in one patient with known glaucoma. In 10 out of 15 eyes the visual field was markedly smaller following the water drinking test. It can be assumed that the detachment became larger because of an increase in the subretinal fluid while the osmotic pressure in the blood plasma decreased. This effect is of only short duration. (5 references) Frederick C. Blodi.

Lijo Pavia, J. **Partial lesions with luminescent crystals within the macula and around it.** Arch. oftal. Buenos Aires **27**: 532-538, Dec., 1952.

The results of some experimental work done on rabbits as well as the findings and treatment of several patients are reported. The author found that the luminescent crystalline lesions (probably impregnations of cholesterin) are reversible, therefore in these cases it is essential to determine the amount of cholesterol in the blood. The treatment must be based on a hypocholesterol diet, increasing biliary function since bile is the principal medium for eliminating cholesterol, and the intensive use of lipotropic substances, thyroxin, insulin, and iodides. If the lesions persist, the treatment should be reinforced with hormones and gonadotropin.

Joseph I. Pascal.

Lijo Pavia, J. **Macula. A rare tapetoretinal degeneration with the appearance of luminescent crystals.** Arch. oftal. Buenos Aires **27**:452-461, Oct., 1952.

In the four cases of macular degeneration reviewed, these common characteristics were observed. 1. The essential lesion was in the macula, and all showed the presence of numerous brilliant points, luminescent crystals, probably of cholesterol 2. Central vision was lost; one patient had vision of 1/10, two had vision of less than 1/20, and the fourth, only finger counting at 30 cm. 3. In three of the patients the symptoms began in adult life and in one in later manhood. 4. None showed any inflammatory changes. 5. In those who showed a hypercholesteremia, which suggested endocrine disturbances, adequate treatment produced an improvement which was maintained for three years. 6. In the single case with syphilis, specific treatment produced an improvement of vision. 7. In the four cases seen, atrophy of the choroid in the macular region was observed, a logical complica-

tion of a degenerative process of the macula. 8. In three cases there was impairment of color vision and of dark adaptation. In the fourth case this could not be determined. Joseph I. Pascal.

Puga, Ruy. **Transconjunctival localization of retinal tears and notes on surgery of retinal detachment.** Arch. Soc. oftal. hispano-am. **13**:154-159, Feb., 1953.

Puga advocates preliminary localization of the retinal tear by transconjunctival perforating diathermy several days in advance or immediately preceding the operation. After a retrobulbar injection and instillation anesthesia, a perforating electrocoagulation is made with a perforating electrode, in the region determined ophthalmoscopically, using a current of 50 to 70 milliamperes, for 5 to 8 seconds. After this the patient is taken into the dark room and again ophthalmoscoped to determine the relation between the coagulated point and the tear. The exact preliminary localization permits an exact exposure of the surgical field by a much smaller incision, reduces the extent of surgery required, and shortens the time of the operation. Perforation of an extraocular muscle is of no consequence, but injury to the vortex veins should be avoided. With the exception of tears in the posterior segment and those located nasally, most retinal tears are easily localized in this manner. This preliminary localization is of articular value in cases with multiple tears. In cases with large detachments the author makes this preliminary localization before the patient is put to bed preparatory to surgery. In some cases the subretinal fluid is evacuated by the puncture and the retina flattens out, providing some indications as to retinal mobility. In eyes with small detachments the operation is performed immediately after the localization. With the exception of one case, in which there was a recurrence two months later, thirteen patients were treated successfully in this manner. The author points out that perforating coagulations lead to more rapid adhesion of the retina to the choroid by the penetration of highly vascular episcleral tissue through the opening. Superficial coagulation on the other hand leaves an area of necrotic sclera which acts as a barrier to the penetration of vascular tissue into the globe. In cases in which contraction of the globe is desirable, superficial coagulation may be employed to advantage. The author mentions three cases of typical horseshoe-shaped retinal tears in the superior quadrant without detachment in which recovery was spontaneous; the history of all three was similar; that of a vitreous detachment and flocculent hemmorrhage in the vitreous. Ray K. Daily.

Safar, K. **The prophylactic operation of retinal tears and holes without detachment.** Klin. Monatsbl. f. Augenh. **122**:277-286, 1953.

In well demarcated detachment of the lower segment (not involving the macula) an operation is not indicated if the retina is too atrophic to promise an increase of the visual field after the operation. The author discusses four cases of retinal hole without detachment. All of them remained stationary. He advises against a prophylactic operation in these cases except when the fellow eye has had a true idiopathic detachment. Surface coagulation is the treatment of choice. (21 references, 3 figures)

Frederick C. Blodi.

Samuelly, C. **Retinal detachment following tenonitis.** Arch. di ottal. **56**:225-232, May-June, 1952.

A tenonitis in a man, 57 years of age, was accompanied by detachment of the retina. Treatment with penicillin and local applications of hot ichthyol packs was followed by a purulent discharge

through a conjunctival perforation and uneventful healing of the tenonitis. The retina re-attached itself spontaneously.

John J. Stern.

Sbordone, G. **Lipoid extracts and the retina.** Arch. di ottal. **56**:305-317, July-Aug., 1952.

The author has treated various diseases of the retina (myopic fundus changes, tapeto-retinal degenerations, chorioretinitis of vascular origin, diabetic neuroretinitis, senile and traumatic macular degeneration) and detachment which has been successfully treated surgically with as many as 15 subcutaneous injections of retinal lipoid extracts ("cellulin retinale"). All 34 patients claimed subjective improvement; the majority showed some demonstrable improvement of visual acuity; the improvement was maintained after cessation of therapy although the fundus changes remained unaltered. The best results were obtained in seven patients with retinal detachment who had been treated surgically with success. It is assumed that these results are due to the specificity of the lipoid extracts which are incorporated into the depleted rods and cones and normalize their activity.

John J. Stern.

Sun, S. F. **Fundus Changes in aplastic anemia.** Chinese M. J. **1**:45-53, Jan.-Feb., 1953.

Sun reports the ophthalmoscopic examination of six patients in whom a diagnosis of aplastic anemia was based not only on clinical but also on pathologic studies. In the early stage the retinal arteries were attenuated and the veins engorged and there were small superficial and also rounded hemorrhages. Later the disc margins were blurred and flame-shaped hemorrhages and round white exudate appeared. The vessels were pale. The amount of retinal hemorrhage is not helpful in prognosis.

F. H. Haessler.

Urrets Zavalia, Alberto. **The arteriovenous crossings in relation to venous obstructions of a branch in the retina.** Arch. oftal. Buenos Aires **27**:316-317. July, 1952.

The author reiterates his previous opinion (in answer to some criticism) that thrombosis of a venous branch, which almost always occurs at the arteriovenous crossing, results from the formation of adhesions between the adjacent tissues of the two vessels. Anatomic studies of Koyanagi clearly show that at those points the adventitias of the vein and artery form a single structure by fusion of the tissues. Joseph I. Pascal.

12

OPTIC NERVE AND CHIASM

Andersen, C. **Pits of the disc with visual defects.** Klin. Monatsbl. f. Augenh. **122**: 159-168, 1953.

Two cases of pits in the optic nerve are described; in each there were large nerve-fiber scotomas. Frederick C. Blodi.

Proksch, M. **The changes of the physiologic cup occurring with age.** Klin. Monatsbl. f. Augenh. **122**:168-172, 1953.

Glaucoma is a disease of advanced age. Patients with only slightly elevated tension may have a far advanced glaucomatous cupping. These two facts have led the author to a detailed examination of the physiologic cup in various age groups. It could be shown that large excavations occur in older patients while children have only a small excavation or a vessel funnel. It can be assumed, therefore, that the physiologic excavation increases with age. The reason for this change is probably an atrophy of connective and of glial tissue, as it occurs in other parts of the eye and the body. The optic nerve is then less protected against the normal or slightly increased intraocular pressure.

Frederick C. Blodi.

Smith E. L. **Intravenous use of corticotropin in optic neuritis.** A.M.A. Arch. Ophth. **49**:303-312, March, 1953.

The current literature on the subject is reviewed and the successful treatment of a patient described. The drug was given in doses from 10 to 40 mg. per 24 hours in 1,000 cc. of 5 percent dextrose in water. The time during which the dose was given was eight hours at a rate of 30 drops per minute. G. S. Tyner.

Yonemura, T., Watanabe, Y., Nango, R., and Murakami, K. **A cross scotoma in retrobulbar optic neuritis.** Acta Soc. Ophth. Japan **57**:229-233. May, 1953.

In a flicker test, in cases of acute and chronic retrobulbar optic neuritis, the authors found a considerable reduction in the fusing power on the vertical and horizontal meridian of the visual field. They carefully examined, therefore, the visual fields of these patients and very often found a horizontal and vertical, linear, relative scotoma as an elongation of a central scotoma. They consider such a cross scotoma to be related to the "discontinuity of the visual field" of Lanchester and to the "raphe formed by the meeting of the upper and lower paramacular fibers" of Rönne.

Yukihiko Mitsui.

13

NEURO-OPHTHALMOLOGY

Bonnet, P., and Bonnet, I. **The syndrome of the foramen lacerum.** Arch. d'opht. **13**:121-126, 1953.

The authors report a case of the syndrome of the foramen lacerum, a syndrome resulting from aneurysm of the internal carotid artery as it leaves the foramen. The patient, a man of 48 years, had suffered from migraine with vomiting since childhood. Three years previously the patient had noticed a transient diplopia, recurrent at intervals, but the actual disease came on suddenly at night with excruciating headache, vertigo, vomiting, and permanent diplopia. This was followed by ptosis of the right upper eyelid. Twelve days later there was loss of sensation in the cheek of the same side. Examination revealed paralysis of the third and fourth nerves, hypoesthesia of the cornea, complete ptosis, and slight exophthalmos. Radiography showed enlargement and deformation of the sphenoidal fissure and erosion of the anterior clinoid processes. Angiograms showed an aneurysm the size of a prune in the middle cerebral fossa. The patient refused surgery. The authors credit Jefferson for his description of the syndrome in 1937.

Phillips Thygeson.

Cavka, V. **The operative technique of transorbital leukotomy.** Arch. d'opht. **13**: 146-155, 1953.

The author states that in addition to the classical prefrontal lobotomy there exist other psychosurgical operative methods, such as thalamotomy (Spiegel, 1947), prefrontal gyrectomy-topectomy (Penfield, Pool, 1949), lobectomy (Peyton, Noran, Miller, 1940), as well as the transorbital leukotomy described by Fiamberti in 1937. He considers transorbital leukotomy to be of special interest to ophthalmologists and describes the history of the operation and its technique in detail. He proposes certain modifications of the technique of Fiamberti and Freeman, including an incision through the eyebrow and the use of a motor-driven trephine to penetrate the orbital bone. He urges that special care be taken to avoid injury to the lacrimal gland and superior oblique muscle. In 10 patients with schizophrenia operated on by this method there were no important complications. Minor complications included edema and hematoma of the lid, transient partial ptosis, transient meningismus in two cases, and vomiting in two.

Phillips Thygeson.

Del Rio Cabanas, José Luis. **Acute inflammation of the ciliary ganglion.** Arch. Soc. oftal. hispano-am. **13**:66-72, Jan., 1953.

The author reports a case of internal ophthalmoplegia and retrobulbar neuritis in a woman, 36 years old, with a history of rheumatism and infection of the urinary tract. Because of the absence of encephalitic symptoms, the author makes the diagnosis of an acute lesion of the ciliary ganglion. The literature is critically reviewed. The author refutes Elschnig's contention that disturbance of the motor fibers of the ciliary ganglion is always associated with trophic ocular disturbances. He believes that because of the difference in the anatomic relationship of the motor and sensory portions of the ciliary ganglion, the motor fibers are more vulnerable and may become affected, while the sensory portion escapes injury. Ray K. Daily.

Dubois-Poulsen, A. **Variations of sensibility and nervous interactions in the visual field.** Ann. d'ocul. **185**:1025-1052, Dec., 1952.

In this very important contribution the author points out that the idea of the visual field is too geometric. It is more than an optical instrument. Constant variations of sensibility take place in it and many things influence it. The author stresses particularly the elementary processes of vision and those which regulate the function of the nervous system. The visual field has no absolute limits and its asymmetries cannot be geometrically explained. The diurnal and nocturnal fields are different, involving light and color sensation; nocturnal scotomas can exist without corresponding diurnal ones. Nervous interactions in the interior of the field introduce marked variation through the interplay of summations, facilitation, occlusion and inhibition. Disturbance of spatial summations is a test of peripheral injury of the optic pathway and often of retinal edema.

Scotomas of the middle region, on Marriot's spot, and angioscotomas are very variable. A recent discovery of Goldman makes it possible to distinguish the parts played by the vascular shadows and the nervous synapses. Color vision is subject to periodic peripheral disappearance which could furnish interesting methods of perimetric examination as yet little studied. Binocular vision introduces many variable factors, binocular summations, enlargement of Marriot's spot, color scotomas, whose central origin could perhaps be of clinical value. The clinician must not be discouraged by the variable character of the visual field; its measurement is sufficiently accurate and accessible for the needs of diagnosis.

B. T. Haessler.

Focosi, M., and Toselli, C. **Vertical tropia due to labyrinth stimulation during abolished fusion.** Boll. d'ocul. 32:3-7, Jan., 1953.

A low degree of vertical deviation was found in previous investigations of normal persons subjected to rotatory or thermic stimuli as well as in patients suffering from Menière's syndrome. The present study comprises 16 patients, unable to maintain fusion because of unilateral or bilateral amblyopia or blindness or both, nine with severe mental disease, during electric shock treatment, six surgical patients with otherwise normal visual functions observed during general anesthesia, and two patients unconscious because of tuberculous meningitis. In the first group, more marked deviations were observed (up to 30 or 40 degrees) in blind than in amblyopic persons; 10 to 20 cc. of water at 20°C provoked tonic vertical deviations lasting from 30 to 80 seconds. Mostly the eye on the side of the labyrinth stimulated showed hypophoria; the opposite occurred in one case only. The hyperphoria

was preceded by a short period of nystagmus in all cases. In the patients subjected to general anesthesia, the vertical deviation was superimposed upon the deviation due to the anesthesia; often the eyes were in elevation or in conjugate deviation before the stimulation of the labyrinth was started; if so, the downward-tending eye sometimes did not go below the horizontal meridian of the palpebral fissure while the other eye, contralateral to the stimulation, remained in upward deviation. The results are discussed. (references) K. W. Ascher.

Guttner, Wladyslaw. **A case of ophthalmoplegia internuclearis.** Klinika Oczna **22**:425-432, 1952.

Internuclear ophthalmoplegia in a woman, 41 years of age, is described. There was paralysis of both internal rectus muscles for lateral movement without affecting convergence, intermittent paresis of the left lateral rectus, the lower branch of the right facial nerve, and of the right upper lid, and also damage to the nucleus and the trunk of the vestibular nerve. The complex of symptoms suggested a number of small lesions in the upper part of the medulla and in the area of the pons affecting the nuclei of the oculomotor and the vestibular nerves. The patient recovered completely after seven weeks. The author feels that multiple sclerosis was the cause.

Sylvan Brandon.

Uihlein, A., and Weyand, R. D. **Meningiomas of anterior clinoid process as a cause of unilateral loss of vision.** A.M.A. Arch. Ophth. **49**:261-270, March, 1953.

Unilateral loss of vision may result from a meningioma of the anterior clinoid process of the sphenoid bone due to the direct effect of pressure by the tumor on the retrobulbar portion of the optic nerve. This occurred in 15 out of 108 cases of unilateral blindness due to lesions of the optic nerve and pathways. Treatment of these cases is always surgical. The records of 52 patients operated upon were reviewed. The immediate post-operative mortality was 32.7 percent or 17 of 52 cases. Five more deaths occurred within 7 years. Early recognition is urged to facilitate total removal of the tumor and prevent blindness and death. Early neurosurgical consultation, careful studies of the visual fields, and steriolateral roentgenograms of the skull in patients with unilateral blindness of unknown cause is urged. G. S. Tyner.

Yanagida, N. **Ocular symptoms of para-aqueductal tumor.** Acta Soc. Ophth. Japan **57**:254-258. May, 1953.

In 9 cases of para-aqueductal tumor, the ocular symptoms were examined. Of these 9 cases, choked disc was demonstrated in 8, diplopia in 4, blepharoptosis in 3, palsy of the external rectus in 3, conjugate deviation upward in 5, mydriasis in 5, loss of light reflex in 6 and nystagmus in 4 cases. Yukihiko Mitsui.

14

EYEBALL, ORBIT, SINUSES

Chavarria Iriarte, Ricardo. **Ulceration of the cornea caused by exophthalmos, resulting from a traumatic orbital hematoma.** Arch. Soc. oftal. hispano.-am. **13**: 73-78, Jan., 1953.

A nine-year-old boy presented himself with exophthalmos of the right eye, associated with immobility of the lids and globe, downward displacement of the globe, loss of corneal sensitivity, and ulceration of the lower half of the cornea. This clinical picture was attributed to an orbital hematoma, resulting from a blow on the globe in a collision with another child. The result upon recovery was symblepharon, which was corrected surgically, and corneal leucoma. The etiology of unilateral exophthalmos is reviewed. (1 figure) Ray K. Daily.

Matera, R. F., Insausti, T., and Prado, J. **Tuberculoma of the orbit.** Arch. oftal. Buenos Aires **27**:429-439, Oct., 1952.

This is a very rare disease, and the authors stress the rapid development of the process and its association with an old pleuropulmonary lesion, as reported also by Strada and Marfan. In this patient, however, there were caseating lesions. The Koch bacillus was not found, but neither were other types of bacteria. Tuberculoma of the orbit may be considered as a hematogenic lesion in the second phase of the secondary stage, with a tendency to localization and caseation in the tertiary stage.

Joseph I. Pascal.

15

EYELIDS, LACRIMAL APPARATUS

Cramer, Federico E. K. **Dacryocystorhinostomy in very young children.** Arch. oftal. Buenos Aires **27**:559-564, Dec., 1952.

As a result of seven operations, the author concludes that dacryocystorhinostomy can be done on small children (2½ years old or more) when there is no anatomic hindrance. The operation should be performed under general anesthesia, so administered that the field of operation is not obstructed. The small operative field and small structures necessitate proper instrumentation. One should be prepared to control hemorrhages, which usually occur, by coagulants and aspiration. The possibility of operating on both sides in a single session has been shown in one case of a 5-year-old boy.

Joseph I. Pascal.

Galvez Montes, José. **Angioma of the lacrimal sac.** Arch. Soc. oftal. hispano-am. **13**:174-178, Feb., 1953.

A case of bloody tears in a 57-year-old woman is reported. Treatment consisted of excision of the lacrimal sac. Histologic study of the sac demonstrated the presence of an angioreticuloma. The etiology of bloody tears is discussed.

Ray K. Daily.

Hartmann, K. **Operation for senile entropium.** Klin. Monatsbl. f. Augenh. **122**: 202-204, 1953.

The author recommends the electrocoagulation of Ziegler for mild cases. For severe cases he uses the plastic operation of Wessely. A flap of skin is mobilized from the center of the lid margin down and outward. The upper part of the flap remains in contact with the tarsus while the lower border is shortened.

Frederick C. Blodi.

Jäger, A. **Experiences with the lacrimal catheter.** Klin. Monatsbl. f. Augenh. **122**: 353-354, 1953.

In order to dilate a narrow lacrimal punctum, repeated dilations are advisable. The splitting of the canaliculus is unphysiologic and should not be done. In order to guarantee continuous dilatation the author uses small, angled catheters which can remain for 1 to 2 weeks in the canaliculus. (1 figure)

Frederick C. Blodi.

Kreibig, W. **The ptosis operation of Friedenwald and Guyton.** Klin. Monatsbl. f. Augenh. **122**:205-207, 1953.

The results were uniformly good in 23 eyes operated on with this simple, but extremely effective method.

Frederick C. Blodi.

Lepri, G., and Ercoli, G. **Sjögren's disease.** Rassegna di fisiopat., clin., e terap. **24**:617-662, 1952.

The authors give a detailed report of three patients with keratoconjunctivitis sicca and associated conditions. The manifestations of the disease are described. A full account is given of the ocular lesions and of the changes in the other mucous membranes and in the skin, and of the

joint involvements. The etiology of this disease is still obscure. The authors believe they can exclude an infectious origin or a vitamin deficiency. All three patients showed hormonal disturbances. A neuroendocrinal disturbance of the diencephalon and the pituitary is considered. (14 figures, 57 references)

Frederick C. Blodi.

Malamud, B., Aristides, C., and Foix, A. **Pointed condyloma on the lid margin, rare localization.** Arch. oftal. Buenos Aires **27**:292-296, July, 1952.

Probably as a result of self-infection, a woman who had multiple pointed condylomas on the vulva, vagina, and the neck of the uterus, and was being treated for hemmorrhages and Trichomonas vaginalis, developed a condyloma on the conjunctival border of the right lower lid. The author suggests that in all cases of palpebral papillomas an examination be made of the genital organs and the axilla.

Joseph I. Pascal.

O'Connor, G. B., and McGregor, M. W. **Associated congenital abnormalities of the eyelids and appendages (syndrome).** Plast. & Reconst. Surg. **11**:348-352, May, 1953.

From a collection of seven cases, the authors describe a syndrome with the following features: 1. bilateral ptosis of the upper lids resulting from aplasia of the levator muscle; 2. abnormally elevated and stretched eyebrows; 3. deficiency of skin in both upper and lower lids, and the absence of the normal upper lid fold; 4. epicanthal folds of the inversus type with marked lateral displacement of the inner canthal angles; 5. short and narrow palpebral fissures; 6. poorly developed nasal bridge and 7. normal mentality though facial expression does not always indicate it. The ptosis brings about slight posterior head tilt and constant spasm of the frontalis muscle to permit vision, because the upper lids cover the upper half of the pupil.

The correction of this condition is much more difficult than that of simple epicanthus in which the fold of skin arises in the lower lid and runs crescentrically upward disappearing in the upper lid which is relatively unaffected. For this epicanthus the authors recommend Spaeth's epicanthal operation which places the medial nasal flaps in the upper and lower lid areas where the skin is short. One patient of this series was operated upon elsewhere with bilateral Blaskovics procedure but the blepharophymosis, epicanthal fold and ptosis are still present. The authors have performed operations for the epicanthus inversus only in two of their cases, with some improvement. They have not operated for the ptosis. They plan to perform a free skin graft on the upper lids to increase the skin deficiency and later insert a fascial sling to assist the frontalis muscle action.

Alston Callahan.

Pereira, R. F., Castillo, J. M., and Nocetti, A. **A rare late complication of dacryocystorhinostomy.** Arch. oftal. Buenos Aires **27**:395-399. Sept., 1952.

Among late complications of this operation are 1. a keloid cicatrix of the skin, and 2. the formation of protuberances or proliferation of the nasal mucosa which leads to an obstruction of the lacrimonasal passage. The case presented here exhibited one of these late complications. In this patient the mucosa of the septum must have been injured, since it is so close to the field of operation. As a result synechias formed which obstructed the flow of tears. This complication could have been avoided if the deviation of the septum had been diagnosed and a submucosal resection had been done before operating on the lacrimal sac.

Joseph I. Pascal.

Rossi, A. **Immature sarcoma of the lymphoreticular tissue of the lacrimal**

gland. Arch. di ottal. **56**:27-44, Jan.-Feb., 1952.

Rossi reviews the literature and reports one case. John J. Stern.

16

TUMORS

Filho, A. Paulo. **Epibulbar tumors.** Rev. brasil. oftal. **10**:67-106, Dec., 1951.

In this paper, presented before the third Pan American Congress of Ophthalmology, the author discusses the tumors developed in the conjunctiva, episclera, sclera, limbus and cornea. Several charts are presented in an attempt at an orderly classification of epibulbar tumors. The author makes a plea for establishment of an accepted uniform classification. (29 figures) Theodore Bisland.

Lijó Pavía, J. **Bilateral neuroblastoma unsuccessfully treated with radium therapy.** Rev. oto-neuro-oftal. sud am. **28**:13-16, Jan.-Feb., 1953.

The author reports the case of a girl, 19 months old, in whom the parents noticed an amaurotic reflex in the left eye 10 months before the first visit, and seven months later, in the right eye. He describes the fundus of each eye in detail. In the five months after the first visit the patient had received 5,160 r in her right eye, and 7,720 r in the left one, and this one had to be enucleated because of severe irritative signs. The radium therapy in the right eye was continued, but the tumor continued to progress and several months later the patient, having received a total of 13,000 r in her right eye, had a recurrence of the neoplasm in the left socket. One month later, the patient died. The author gives a detailed pathologic report of the eye which was diagnosed as neuroblastoma of the retina. (1 figure) Walter Mayer.

Trevor-Roper, P. D., Newton, K. A., and Nicholson, J. P. **Radio-active di-iodofluorescein in the diagnosis of intra-ocular tumors.** Brit. J. Ophth. **36**:543-546, Oct., 1952.

Observations were made on malignant intraocular tumors using radio-active di-iodofluorescein. There was no significant increase in the Geiger counter rates in the affected eye. The selective uptake of the radioactive dye by melanoma is small or negligible. This technique is not recommended by the authors.

Orwyn H. Ellis.

17

INJURIES

Biernacka-Biesiekierska, Jadwiga. **Experimental ophthalmoconiosis.** Klinika Oczna **22**:291-300, 1952.

Four groups of rabbits were exposed to four different dusts: soap, cleaning powder, coal, and sandstone. The amount of dust in the air of the cages was controlled and brought to the levels encountered in the plants. The tears became slightly more alkaline and diuresis was initially increased and later decreased. The rabbits were killed at different intervals and their eyes examined. Changes were found in the epithelium and the stroma of the cornea and in the conjunctiva. Particles of foreign matter were found in the epithelium and even in the stroma. The author stresses the fact that the widely known pneumoconiosis is only a part of the disease. The eye is also affected and the author hopes that this occupational disease will be given more attention. Sylvan Brandon.

Butscher, P. **Damage to the eye with thioglycolic acid. (Coldwave)** Klin. Monatsbl. f. Augenh. **122**:349-350, 1953.

A case of accidental injury to the eye with a concentrated solution of thioglycolic acid as used in cold waves is presented. A good therapeutic result was achieved with vasodilators. (2 references) Frederick C. Blodi.

Kopec-Zaleska, Ewelina. **Evaluation of results in the treatment of corneal wounds by suturing and by the conjunctival flap.** Klinika Oczna **22**:377-386, 1952.

The results of treatment of 312 perforating wounds of the cornea and the sclera are presented. Of 312 injured, 148 were children. Of 70 eyes enucleated 22 were severely infected when first seen and were enucleated without any corneal repair. For linear wounds without gaping conservative treatment is indicated. Large gaping wounds should have corneal sutures and small irregular peripheral wounds a conjunctival flap. Extensive, irregular wounds may do better if treated by a combined method of direct corneal sutures and a conjunctival flap.

Sylvan Brandon.

18

SYSTEMIC DISEASE AND PARASITES

Alagna, G. **A rare ocular complication of Reiter's syndrome.** Arch. di ottal. **56**: 5-26, Jan.-Feb., 1952.

A patient with Reiter's syndrome with the complete triad of urethritis, keratoconjunctivitis and painful joints developed retrobulbar neuritis. Paramino-benzoic acid was effective in treatment, and the question is discussed whether an antiallergic, an anti-infectious or a more specific process was responsible for the therapeutic result. John J. Stern.

Chavarria Iriarte, F. A. **Ocular manifestations of brucellosis.** Arch. Soc. oftal. hispano-am. **13**:179-198, Feb., 1953.

The literature is reviewed and four cases are reported. In one there was a retinal detachment of the left eye with a tear in the superotemporal region. The second case was that of uveitis with a uveitic cataract and posterior synechia, paralysis of the external rectus and eczema of the skin of the lids. The third case was that of uveitis with uveitic cataract of the right eye and optic atrophy in the left. In the fourth there was bilateral optic atrophy. Therapy at present includes the intramuscular administration of streptomycin, aureomycin orally, cortisone, ACTH, tonics and vitamins. Aureomycin, terramycin and cortisone are applied topically. Ray K. Daily.

Gandolfi, C. **Ocular leishmaniasis in Abbruzzo.** Arch. di ottal. **56**:59-64, Jan.-Feb., 1952.

A survey is reported of the occurrence of involvement of the lids in leishmaniasis during a period of four years (266 cases, the majority of the sarcoid type) and of the results of therapy with N-methyl-glucaminic antimony. The sarcoid form, Aleppo boil and epitheliomata are most resistant to this new drug, the lupus type and the mucous and cutaneomucous lesions respond most readily.

John J. Stern.

Giardulli, Antonio. **Reiter's syndrome.** Rev. brasil. oftal. **10**:109-114 Dec., 1951.

The author reviews the history of Reiter's syndrome, from the time it was first described to the present. The classical triad described by Reiter was urethritis, conjunctivitis and arthritis; his original case was preceded by dysentery and fever. Giardulli advises symptomatic therapy, and an attempt to find out the possible cause of the disturbance. Streptomycin, cortisone, and foreign protein therapy should be considered as adjuncts in the treatment of this syndrome.

Theodore Bisland.

Marsico, V., and Petrone, P. **Bilateral malignant exophthalmos of hypophyseal origin.** Arch. di ottal. **56**:249-264, May-June, 1952.

A 58-year-old woman exhibited signs of hyperthyroidism, particularly bilateral exophthalmos and bitemporal hemianopic fields. The basal metabolic rate was +22.

Radiographs of the skull were negative. In spite of therapeutic attempts the left cornea became perforated. The theory of the interrelationship between the hypophysis and the thyroid gland is discussed.

John J. Stern.

Recupero, E. **The ocular complications of the aleukemic lymphadenoses.** Arch. di ottal. **56**:45-58, Jan.-Feb., 1952.

Two small indolent tumors in the lower lid were diagnosed as simple lymphomas, but six months later new tumors appeared in the region of the lacrimal sac and on the bulbar conjunctiva and several enlarged lymph nodes were observed elsewhere. The spleen was enlarged. The diagnosis of aleukemic lymphadenosis was made and intravenous injections of chloramin were followed by complete recovery and no relapse for two months.

John J. Stern.

Sedan, J., Ourgaud, A. G., and Guillot, P. **The ocular accidents of smallpox vaccination.** Ann. d'ocul. **186**:34-61, Jan., 1953.

In 1902 Dekker found only two cases of ophthalmic complications in 2,057 vaccinations. Among 850,000 vaccinations done in Marseille in March, 1952, there were 34 cases of smallpox and 19 of ocular infection. Each one of these cases is reported in detail: nine involved the lids, six the cornea, one the iris and three the oculomotor muscles. Eye involvement occurs as readily in re-vaccination as in primary vaccination and a cornea once infected is not immune, but may become repeatedly involved. Neither the origin of the vaccine nor the age of the patient are factors in bringing about involvement of the eye, but poor health generally, lesions such as blepharoconjunctivitis and phlyctenules, trauma, and previous oculomotor disturbances are predisposing agents. Vaccinia of the cornea from direct inoculation develops in six to eight days, but interstitial and disciform keratitis due to general infection by the vaccine develop after 15 days. Prognosis is generally good, as aureomycin, by instillation in mild cases, subjunctival injection in severe, and cortisone, similarly used, are extremely effective; penicillin, however, proved to be without benefit. (130 references) B. T. Haessler.

Shimoyama, J. **The blood pressure of the anterior ciliary artery in the diagnosis of hypertension.** Acta Soc. Ophth. Japan **57**:313-327, June, 1953.

In 57 normal subjects the blood pressure of the anterior ciliary artery and that of the central artery of the retina were measured and were found to average 65 and 66 mm. Hg respectively. One of the measurements did not differ by more than 3 mm. Hg from the other in the same individual. In 50 cases of essential and 20 of renal hypertension an increase in the pressure of the retinal and ciliary artery was observed. In these cases the degree of the increase was higher in the retinal than in the ciliary artery, and the difference in the pressures in these arteries averaged 12 and 5 mm. Hg in essential and renal hypertension respectively. In 30 cases of the "intracranial hypertension," there was an increase in the tension in the ocular arteries without systemic hypertension. In 14 of the 30 cases the hypertension was observed in both of the ocular arteries; in 14 others, the hypertension was seen only in the retinal artery and in two only in the ciliary. The author believes that the blood pressure in these ocular arteries should be measured when making a diagnosis of hypertension.

Yukihiko Mitsui.

Wilczek, Marian. **Tuberculous and scrofulous diseases of the eye.** Klinika Oczna **22**:339-356, 1952.

The author discusses the pathogenesis of tuberculosis of the eye. Scrofulous diseases are usually due to sensitization of

the eye with tuberculosis and the actual disease may appear because of another superimposed disturbance. Tuberculous infections of the eye take different forms depending on the degree of the local and general resistance and local and general sensitization. Diagnosis of tuberculosis of the eye is based on the general examination of the patient. A strongly positive Mantoux test is strongly suggestive of the presence of tuberculosis. Successful treatment with tuberculin is not a proof of a tuberculous origin of the disease in the eye. In the treatment of tuberculosis one should strive to decrease the hypersensitivity. Stimulation of focal inflammation should be avoided. Bactericidal agents such as streptomycin, and paraaminosalicylic acid should be used. Scrofulous conditions of the eye, being of allergic character, should respond to desensitising and bactericidal treatment.

Sylvan Brandon.

19

CONGENITAL DEFORMITIES, HEREDITY

Costi, C. **A case of Crouzon's disease.** Arch. Soc. oftal. hispano-am. **13**:144-153, Feb., 1953.

The author reports a case of oxycephaly in a six-year-old boy with exophthalmos, divergent strabismus, and vision limited to counting of fingers at two meters. There was no history of oxycephaly or other congenital defect in the family. The child was born after a difficult and slow labor, and his mother was in a state of undernutrition caused by the privations of war. The malformation is attributed to the difficult labor, as a result of which there was not only mechanical damage to the infant's head, but also damage to the nerve centers, principally the diencephalon, through anoxia. The patient's metabolism was high, probably because of hyperthyroidism, indicating a relation between the embryopathy and endocrinopathy. The optic atrophy is attributed to a stenosis of the optic canals, which was demonstrable with X-rays. (6 figures)

Ray K. Daily.

Hoffman-Egg, L., and Velissaropoulos, P. **Oculoauricular malformations and their relation to mandibulo-facial dysostosis.** Ann. d'ocul. **186**:155-169, Feb., 1953.

Three of the five cases described were seen in Zürich, the other two in Athens. All five patients had epibulbar tumors and pre-auricular appendages; three had coloboma of the upper lid, mandibular hypoplasia and one small ear. After listing the malformations in order of growing complexity, the authors try to show how each case is linked to the next by the appearance of new symptoms, which, added to the preceding ones, end as mandibulofacial dysostosis. However, they stress that they do not feel justified in equating the pictures they have seen with so definite an entity as mandibulo-facial dysostosis, nor with the syndrome of Hallermann-Streiff, in spite of the definite similarities. In none of the patients here described could a history of familial congenital malformations be obtained. (7 figures, 3 tables, 13 references)

B. T. Haessler.

Norbis, Atilio L. **Mesodermal malformations of the eye.** Arch. oftal. Buenos Aires **27**:302-315, July, 1952.

A number of patients showing various malformations are described and pictured in detail. The principal lesions are 1. congenital luxation of the crystalline lens with arachnodactyly or Marfan's syndrome, 2. globular or very small crystalline lens with or without luxation, and brachydactyly or Marchesani's syndrome, and 3. congenital cataract with microphthalmos, dwarfism and microcephalus or Hallermann-Streiff's syndrome.

Joseph I. Pascal.

Norbis, Atilio L. **The eye in mesodermal malformations.** Arch. oftal. Buenos Aires **27**:364-375. Aug., 1952.

A number of new cases showing various syndromes embracing many malformations are shown. There are evidently many causes, most of them still unknown, which in some way produce lesions in a group of embryonal cells (the isolated type) or in the genes corresponding to those zones, (the hereditary type). These zones correspond to the diencephalon. The variety and intensity of the malformations depend on the time when the embryonic lesions were produced.

Joseph I. Pascal.

Norbis, Atilio L. **The eye in mesodermal malformations.** Arch. oftal. Buenos Aires **27**:400-420. Sept., 1952.

Several cases of these syndromes among them the syndromes of Marchesani Hallermann-Streiff, and Marfan are described in great detail.

Joseph I. Pascal.

Pau, H., and Rodeck, H. **Hurler's disease (gargoylism).** Klin. Monatsbl. f. Augenh. **122**:141-158, 1953.

The authors describe this rare disease and present two typical cases. This osteochondrodystrophy is a hereditary disease transmitted as a Mendelian recessive. A detailed description of the somatic changes is given. Interesting are the anomalous granulations in some of the neutrophile leukocytes (Reilly). The deposited substance seems to be a polysaccharide or a combination of a sugar with a protein and it is metabolically inactive. The authors describe a few cases with Hurler-like symptoms in which a slitlamp examination of the cornea helped to establish the diagnosis. These cases are called early or infantile dysostosis multiplex. A differential diagnosic table is included which compares the symptoms of Hurler's disease with those of Morquio's dysostosis. The latter does not affect the cornea. Frederick C. Blodi.

Salvi, G. L. **The rare and familial occurrence of retinosis pigmentosa with glaucoma.** Boll. d'ocul. **32**:36-42, Jan., 1953.

A pedigree is presented comprising four generations. Ten children in the third generation, offspring of a father with retinosis pigmentosa whose mother had the same disease, are characterized as follows: four were not examined; two females were affected with both retinosis pigmentosa and glaucoma; three males only with retinosis pigmentosa; the youngest daughter had achondroplasia. The fourth generation, as far as examined, showed six normal boys and two normal girls born from the two sisters with the combined glaucoma-pigmentosa syndrome. The possible mode of transmission is discussed. (references)

K. W. Ascher.

Ullrich, O., and Fremerey-Dohna, H. **The syndrome of dyscephaly, congenital cataract and hypotrichosis.** Ophthalmologica **125**:73-90, Feb., 1953.

One case studied by the authors and several other cases gathered from the literature showed the following combination of congenital anomalies: scaphocephaly with widely gaping sutures, a bird's face with aquiline nose and hypoplastic, strikingly receding lower jaw, congenital cataracts, and a peculiar alopecia around the gaping sutures. The etiology of the syndrome is unknown. No familial occurrence has so far been observed. The syndrome is separable from that of mandibulofacial dysostosis characterized by a normal cranium, lid colobomas, hypoplasia of the mandible, anomalies of the outer ear and a clear-cut hereditary etiology. Peter C. Kronfeld.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bentley, C. S., and Springer, D. A. **The role of certain visual phenomena in adolescent personality adjustment.** Am. J. Optometry **30**:227-243, May, 1953.

160 seventh and eight grade students were tested on the Standard Ortho-rater for comparison with personality studies by the California Test of Personality, and by questionnaires to be filled out by teachers and parents. Results indicated that in this group good vision apparently contributed to good personality adjustment.

Paul W. Miles.

Galewska, Zofia. **First school in Poland for children with defective vision.** Klinika Oczna **22**:415-423, 1952.

The first school for children with defective vision was opened in December 1950. Children whose vision was between 1/3 and 1/20 were admitted provided the mental development was normal. The number of children grew from 11 to 60 in two years. Each classroom has normally 12 pupils. Lighting in the classrooms is both electrical and natural. Children with poorer vision are placed closer to the window and the board. There is constant supervision of the pupils by an ophthalmologist.

Sylvan Brandon.

Mackensen, G. **The behavior of blind or amblyopic children.** Klin. Monatsbl. f. Augenh. **122**:394-402, 1953.

Some of the mannerisms of blind children which are not obviously connected with the lack of vision are discussed. One is rhythmic movements, like rolling of the head or slow shaking of head and chest. These automatic movements are sometimes bizarre and chorea-like. They are not associated with any neurologic or intellectual defect. Poking of the eyes with fingers, probably to get some light sensation, is very common in blind children and does no apparent harm. These mannerisms disappear when the children grow older. (9 figures, 9 references)

Frederick C. Blodi.

Rostkowski, L., and Wolter, H. **Causes of blindness in Poland.** Klinika Oczna **22**:407-414, 1952.

The authors surveyed the records of 2,257 blind subjects. On the basis of this material, which they consider representative of Poland, though not comprising all the cases of blindness, a statistical evaluation of the cause of blindness is presented. The most frequent causes of blindness are infectious diseases, 26.5 percent, next are injuries, 24.7 percent, and the etiology is unknown in 17.8 percent. The last number includes glaucoma (12.8 percent) and retinitis pigmentosa. Blindness was due to congenital conditions in 10.6 percent. Anatomically the atrophy of the optic nerve was the most frequent cause, 30 percent; followed by a leucoma, 18 percent; and phthysis bulbi, 15 percent. Compared with statistics gathered in 1936, Rostkowski shows that blindness from infectious disease has decreased and congenital anomalies have increased.

Sylvan Brandon.

Stump, N. F. **Research in occupational seeing.** Am. J. Optometry **30**:294-307, June, 1953.

In order to make employees aware of the benefits of efficient visual performance, a study was made to correlate refractive and motility findings with earning power, production bonuses, spoiled work, inspection complaints, and the supervisor's judgment in various types of industry. After professional services, there was a rather definite trend toward increased production, in one instance from 1.259 dozens to 1.511 dozens per hour.

Paul W. Miles.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
601 Union Trust Building, Cincinnati 2

News items should reach the editor by the 12th of the month, but, to receive adequate publicity, notices of postgraduate courses, meetings, and so forth should be received at least three months before the date of occurrence.

Deaths

Dr. Lewis Pellman Glover, Altoona, Pennsylvania, died April 22, 1953, aged 52 years.

Dr. John Frank Hardesty, Saint Louis, Missouri, died June 20, 1953, aged 65 years.

Dr. Don Carlos Lindley, New Castle, Pennsylvania, died May 8, 1953, aged 77 years.

Dr. Huga Reim, Saint Louis, Missouri, died April 15, 1953, aged 70 years.

Dr. Harvey Lee Cunningham, Cape Girardeau, Missouri, died April 26, 1953, aged 86 years.

Announcements

University of California conference

The University of California School of Medicine announces an ophthalmologic conference to be held on December 2, 3, 4, and 5, 1953, at the University of California Medical Center and University Extension Building, 540 Powell Street, San Francisco.

Dr. Frederick C. Cordes is chairman of the course and Dr. Peter C. Kronfeld, Chicago, will deliver the eighth Francis I. Proctor Lecture during the conference.

Arrangements have been made this year so that each group will get one session of animal surgery. In this session, the operation, the indications for it, complications, and so forth will be discussed. The operation will then be demonstrated by one of the instructors, and then each student will perform the operation on animal eyes.

The course is open only to graduates of medical schools approved by the Council on Medical Education and Hospitals of the American Medical Association. The fee is $75.00.

Toronto refresher course

The Faculty of Medicine of the University of Toronto offers a refresher course in eye surgery from April 20 to 26, 1954. The instruction will consist of lectures, operative clinics on patients, and cadaver surgery in small groups. The guest surgeons will be John Foster, M.B., F.R.C.S., Leeds, England, and Wendell L. Hughes, M.D., F.A.C.S., Hempstead, New York. The staff of the department of ophthalmology in the university will contribute extensively to the course.

The course will be given for a minimum of 10 students and a maximum of 30 students. Applications should be made to the Dean of the Faculty of Medicine, not later than January 31, 1954.

New Orleans Academy meeting

The winter convention of the New Orleans Academy of Ophthalmology will be held during the first week of February, 1954. The subject of the symposium will be "bacteriology and infectious diseases." Further information may be obtained from Dr. James Allen, 1430 Tulane Avenue, or Dr. George Haik, 812 Mason Blanche Building, New Orleans, Louisiana.

Society of Military Ophthalmologists

The Society of Military Ophthalmologists will hold its annual dinner meeting on Tuesday, October 13, 1953, at 6:00 p.m. at the Palmer House, Chicago. Honorary membership plaques will be presented to Dr. Conrad Berens (for 1952) and Dr. Meyer Wiener (for 1953).

Gill Hospital congress

Among the guest speakers at the annual meeting at the Gill Memorial Hospital, Roanoke, Virginia, April 5 through 10, 1954, will be: Dr. John Foster, Leeds, England; Dr. Edwin B. Dunphy, Boston; Dr. Harvey E. Thorpe, Pittsburgh; Dr. Haynes Martin, New York; Dr. Louis Clerf, Philadelphia; Dr. Alson E. Braley, Iowa City; Dr. H. S. Sugar, Detroit; Dr. George Merriam, Jr., New York; Dr. Victor Goodhill, Los Angeles; Dr. John M. McLean, New York; Dr. John R. Richardson, Boston; Dr. M. Elliott Randolph, Baltimore; Dr. Edmund B. Spaeth, Philadelphia; Dr. Winchell Craig, Rochester, Minnesota; Dr. George Murgatroyd, Baltimore; Dr. Donald Proctor, Baltimore.

Miscellaneous

Gifford to be honored

A commemorative unit dedicated to Dr. Sanford R. Gifford will be part of the new 10-story South Pavilion addition to the Passavant Memorial Hospital, Chicago. Dr. Gifford made distinguished contributions to medicine while practicing, teaching, and conducting research at Passavant Hospital, which is affiliated with Northwestern University Medical School.

Societies

Officers Canadian Society

At the recent 16th annual meeting of the Canadian Ophthalmological Society the following officers were elected: President, Dr. Mark Robert Marshall, Edmonton, Alberta; vice-president, Dr. P. B. Macfarlane, Hamilton, Ontario; secretary, Dr. R. G. C. Kelly, Toronto, Ontario; treasurer, Dr. J. V. V. Nicholls, Montreal, Quebec; editor in chief of *Transactions*, Dr. Clement McCulloch, Toronto, Ontario.

Institute Penido Burnier officers

Officers of the Medical Association of the Institute Penido Burnier, Campinas, for 1953-54 are: President, Dr. Heitor Nascimento; 1st secretary, Dr. Roberto Barbosa; 2nd secretary, Dr. Roberto Franco de Amaral; treasurer, Dr. L. de Souza Queiroz; directors of the *Arquivos*, Dr. Penido Burnier, Dr. Guedes de Melo Filho, and Dr. Gabriel Porto.

Los Angeles officers

Dr. Nathaniel Berman has been elected president and Dr. Arthur S. Gray, secretary-treasurer, of the Los Angeles Branch of the Ophthalmological Journal Club which meets on the second Monday of each month at the Los Angeles County Medical Building.

New York clinical society

The newly elected officers of the New York Society for Clinical Ophthalmology for 1953-54 are: President, Dr. Bernard Fread; vice president, Dr. Frederick H. Theodore; recording secretary, Dr. Bernard Kronenberg; corresponding secretary, Dr. Leon H. Ehrlich; treasurer, Dr. Edward Saskin; historian, Dr. Abraham Scholssman. Dr. Abraham L. Kornzweig, retiring president, was elected to the advisory council.

Chairmen of the various committees are: Program, Dr. Max Chamlin; instruction session, Dr. Arthur Linksz; legislative, Dr. Benjamin C. Rosenthal; membership, Dr. Howard Agatston; industrial, Dr. Jesse M. Levitt.

Central Illinois program

Opening the program of the Central Illinois Society of Ophthalmology and Otolaryngology meeting at Springfield, Illinois, September 18th, 19th, and 20th were travel pictures on "Vacation in Africa," by Dr. Charles B. Voight, Mattoon, Illinois.

The following papers were presented: "Presentation of a new contact lens," Dr. Joseph P. McGoey, Springfield; "Prevention and treatment of complications related to poor healing of cataract incisions," "Recent advances in eye surgery," and "Indications and dangers of beta radiation therapy," Dr. William F. Hughes, Jr., Chicago; "Psychosomatic aphonia," "Neck surgery in otolaryngology," and "Headache," Dr. C. H. McCaskey, Indianapolis; "Avoiding pitfalls in adenotonsilectomy," Dr. H. B. Shepard, Canton.

Nassau meeting

On September 28th, Dr. Irving H. Leopold, Philadelphia, addressed the Nassau Ophthalmological Society. The subject of his address was "Therapy of vascular lesions of the fundus." The next meeting of the society will be on Monday, November 23rd.

Personals

Dr. Bernard Becker, at present at the Wilmer Institute, has been appointed professor and head of the Department of Ophthalmology, Washington University, to replace Dr. Lawrence T. Post who retired from these duties July 1, 1953. Since Dr. Becker will be unable to assume these duties until January 1, 1954, Dr. T. E. Sanders has been appointed acting head of the department until Dr. Becker's arrival.

Dr. Frederick H. Verhoeff, Boston, was awarded a Doctor of Laws degree by Johns Hopkins University, where he had attended medical school. The degree was given in recognition of his outstanding work in ophthalmology. Dr. Verhoeff has been associated with the Massachusetts Eye & Ear Infirmary since 1900, and is on the staff at Harvard Medical School, where he is now a professor emeritus.

At the annual meeting of the Rochester Academy of Medicine, Dr. Albert C. Snell, Sr., Rochester, a former chairman of the A.M.A. Section on Ophthalmology, was awarded the Albert David Kaiser medal. Dr. Snell is the author of *Industrial Ophthalmology* and has published many articles in medical journals. He is a past president of the Monroe County Medical Society and has served as secretary and president of the American Academy of Ophthalmology and Otolaryngology.

Dr. Arthur H. Keeney, clinical instructor in ophthalmology, University of Louisville, is the winner of the 13th annual essay contest, Mississippi Valley Medical Society, "for the best unpublished essay on a subject of practical and applicable value to the general practitioner of medicine." Dr. Keeney's paper is entitled "Grass roots in the prevention of blindness."

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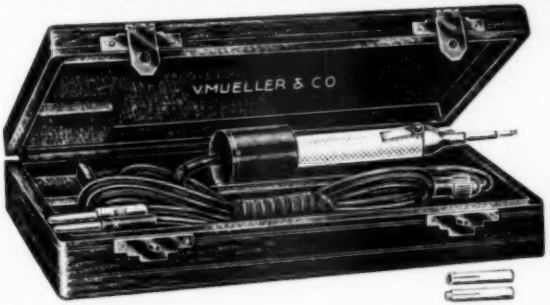

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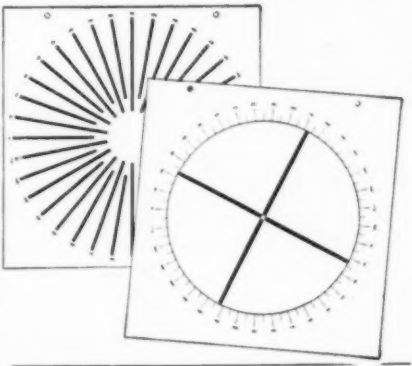

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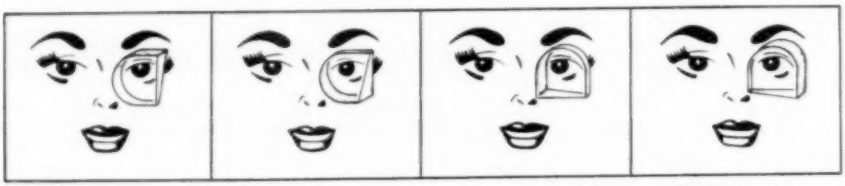

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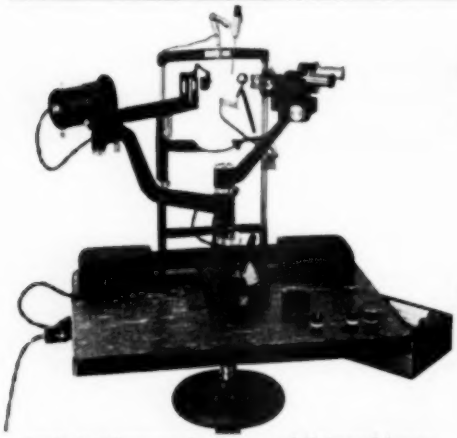

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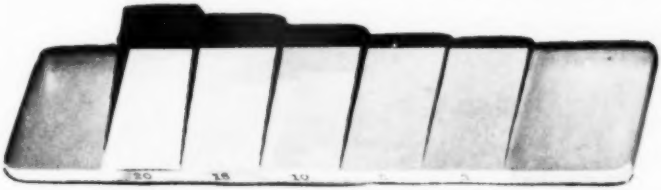

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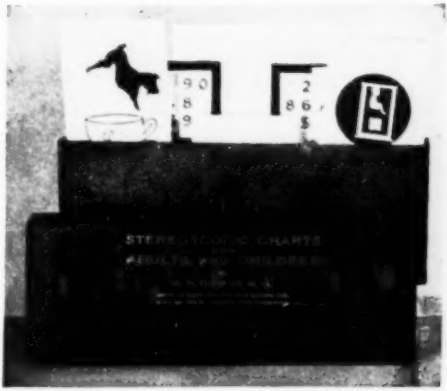

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